

RENOVATION TO  
**CABOT APARTMENTS**  
DETROIT, MICHIGAN

FUSCO, SHAFFER & PAPPAS, INC.  
ARCHITECTS AND PLANNERS

PROJECT NUMBER TRC22.066

**SPECIFICATIONS**

Renovation of  
**CABOT APARTMENTS**  
Detroit, Michigan

TRICE DEVELOPMENT, LLC  
**Owner**  
**13725 Dexter Avenue**  
Detroit, Michigan 48238

FUSCO, SHAFFER & PAPPAS, INC.  
**Architects and Planners**  
550 East Nine Mile Road  
Ferndale, Michigan 48220  
(248) 543-4100

ZEIMET WOZNIAK & ASSOCIATES  
**Civil Engineer**  
55800 Grand River Ave. #100  
New Hudson, Michigan 48165  
(517) 676-9200

KTS ENGINEERING GROUP  
**MEP Engineers**  
494 E. Wright Avenue  
Sheperd, Michigan 48883  
(986) 573-1100

CARNAGHI STRUCTURAL CONSULTING  
**Structural Engineering**  
16950 19 Mile Road  
Clinton Township, Michigan 48038  
(586) 277-0700

DATE: June 24<sup>th</sup>, 2025

MSHDA N23004

SIGNATURE SHEET

Renovation of  
**CABOT APRTMENTS**  
Detroit, Michigan  
MSHDA #N23004

**OWNER:**

TRICE DEVELOPMENT, LLC

BY \_\_\_\_\_

**ARCHITECT:**

FUSCO, SHAFFER & PAPPAS, INC.

BY \_\_\_\_\_

**GENERAL CONTRACTOR:**

G. FISHER CONSTRUCTION

BY \_\_\_\_\_

**MICHIGAN STATE HOUSING  
DEVELOPMENT AUTHORITY**

BY \_\_\_\_\_

**SURETY COMPANY**

BY \_\_\_\_\_

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**SECTION 01 10 00 – SUMMARY****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

**1.2 SUMMARY**

## A. Section Includes:

1. Project Information.
2. Work covered by Contract documents.
3. Access to site.
4. Work restrictions.
5. Specification and drawing conventions.

## B. Related Requirements:

1. Section 01 10 00.01 "General Conditions", for a copy of the AIA General Conditions for the Contract.

**1.3 PROJECT INFORMATION**A. Project Identification: **Cabot Apartments**

1. Project Location: **13725 Dexter Ave., Detroit, Michigan 48238**

Owner: **Trice Development L.L.C.**

B. Architect: **Fusco Shaffer & Pappas, Inc.**C. Construction Manager: **G. Fisher Construction**

1. The terms "Construction Manager" and "Contractor" are synonymous.

**1.4 WORK COVERED BY CONTRACT DOCUMENTS**

## A. The Work of Project is defined by the Contract Documents and consists of the following:

1. Project includes all Civil, Landscape, Architectural, Structural, Mechanical, Plumbing, Electrical, Food Service and Interior Design work to provide a complete and functional building with all applicable permits and licenses obtained.

2. Building will require inspection and approval from and meet all requirements of the City of Detroit. See the drawings and specifications for the delineation of required work.
3. The building is existing and is of masonry bearing construction with wood walls and floor systems. Exterior walls are multi-wythe brick. Existing roof is a ballasted built up roof.
4. See Drawings for Code Analysis.
  - a. Building Codes:
    - Michigan Rehabilitation Code for Existing Buildings - 2021
    - ICC/ANSI 117.1 – 2017
    - Uniform Federal Accessibility Standards (UFAS) – 1991
    - Fair Housing Guidelines – 1998
    - Michigan Mechanical Code – 2021
    - Michigan Plumbing Code – 2021
    - National Electrical Code – 2023 with Michigan Part 8 Rules
    - ASHRAE 90.1 with Michigan “Uniform Energy Code – 2013
  - b. Green Policy – National Green Building Standard – Silver Level. See Section 01 10 00.04 for requirements.

B. Type of Contract:

1. Project will be constructed under coordinated, concurrent multiple contracts. Contracts for this Project include the following:
  - a. As agreed, to by Owner and Construction Manager - AIA Document A102-2007 or Later Standard Form of Agreement between Owner and Contractor where the basis of payment is the Cost of Work Plus a Fee with a Guaranteed Maximum Price.

## 1.5 ACCESS TO SITE

- A. General: Contractor shall have full use of Project Site for construction operations during construction period.

## 1.6 WORK RESTRICTIONS

- A. Work Restrictions, General: Comply with restrictions on construction operations.

1. Comply with limitations on the use of public streets and with other requirements of authorities having jurisdiction.

- B. Nonsmoking Building: Smoking is not permitted on the property.
- C. Controlled Substances: Use of tobacco products and other controlled substances on Project site 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 published as part of the U.S. National CAD Standard and scheduled on Drawings.

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

**PART 3 - EXECUTION (Not Used)**

**END OF SECTION 01 10 00**

**SECTION 01 10 00.01 – GENERAL CONDITIONS**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. AIA Document A201-2007, General Conditions for the Contract for Construction as appended to this Document.

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

**PART 3 - EXECUTION (Not Used)**

**END OF SECTION 01 10 00.01**

**AIA**<sup>®</sup>**Document A201<sup>™</sup> – 2007****General Conditions of the Contract for Construction**

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

**THE OWNER:**  
*(Name, legal status and address)*

**THE ARCHITECT:**  
*(Name, legal status and address)*

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**ADDITIONS AND DELETIONS:**

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

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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 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 and certify termination of the Agreement under Section 14.2.2.

### § 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.

§ 1.2.2 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 will retain all common law, statutory and other reserved rights, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment 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 this 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 material or equipment suppliers are authorized to use and reproduce the Instruments of Service provided to them 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 material or equipment suppliers may not use the Instruments of Service on other projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner, Architect and the Architect's consultants.

#### § 1.6 TRANSMISSION OF DATA IN DIGITAL FORM

If the parties intend to transmit Instruments of Service or any other information or documentation in digital form, they shall endeavor to establish necessary protocols governing such transmissions, unless otherwise already provided in the Agreement or the Contract Documents.

### 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 INFORMATION AND SERVICES REQUIRED OF THE OWNER

§ 2.2.1 Prior to commencement of the Work, the Contractor may request in writing that the Owner provide reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. Thereafter, the Contractor may only request such evidence if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) a change in the Work materially changes the Contract Sum; or (3) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due. The Owner shall furnish such evidence as a condition precedent to commencement or continuation of the Work or

the portion of the Work affected by a material change. After the Owner furnishes the evidence, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.2 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.

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

§ 2.2.4 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.

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

### § 2.3 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.

### § 2.4 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 written 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 deficiencies. In such case an appropriate Change Order shall be issued deducting from payments then or thereafter due the Contractor the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect or failure. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.

## ARTICLE 3 CONTRACTOR

### § 3.1 GENERAL

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

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

§ 3.1.3 The Contractor shall not be relieved of 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 2.2.3, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

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

§ 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 make 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 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, unless the Contract Documents give other specific instructions concerning these matters. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences or procedures, the Contractor shall evaluate the jobsite safety thereof and, except as stated below, shall be fully and 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 written notice to the Owner and Architect and shall not proceed with that portion of the Work without further written instructions from the Architect. If the Contractor is then instructed to proceed with the required means, methods, techniques, sequences or procedures without acceptance of changes proposed by the Contractor, the Owner shall be solely responsible for any loss or damage arising solely from those Owner-required means, methods, techniques, sequences or procedures.

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

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

### § 3.4 LABOR AND MATERIALS

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other

facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

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

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

### § 3.5 WARRANTY

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.

### § 3.6 TAXES

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

### § 3.7 PERMITS, FEES, NOTICES AND COMPLIANCE WITH LAWS

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

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

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

§ 3.7.4 **Concealed or Unknown Conditions.** If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature, that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 21 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 an equitable adjustment 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 in writing, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may proceed as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume

the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

### § 3.8 ALLOWANCES

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

§ 3.8.2 Unless otherwise provided in the Contract Documents,

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

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

### § 3.9 SUPERINTENDENT

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

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner through the Architect the name and qualifications of a proposed superintendent. The Architect may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Architect has reasonable objection to the proposed superintendent or (2) that the Architect requires additional time to review. Failure of the Architect to reply 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 SCHEDULES

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall prepare and submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall not exceed time limits current under the Contract Documents, shall be revised at appropriate intervals as required by the conditions of the Work and Project, shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work.

§ 3.10.2 The Contractor shall prepare a submittal schedule, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, and shall submit the schedule(s) for the Architect's approval. The Architect's approval shall not unreasonably be 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, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

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

### § 3.11 DOCUMENTS AND SAMPLES AT THE SITE

The Contractor shall maintain at the site for the Owner one copy of the Drawings, Specifications, Addenda, Change Orders and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and one copy of approved Shop Drawings, Product Data, Samples and similar required submittals. These shall be available to the Architect and shall be delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

### § 3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

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

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

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

§ 3.12.4 Shop Drawings, Product Data, Samples and similar submittals are not Contract Documents. Their purpose is to demonstrate the way by which 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 requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples or similar submittals unless the Contractor has specifically informed the Architect in writing 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 written 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. 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 cause such services or certifications to be provided by a properly 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, accuracy and completeness of the services, certifications and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor all performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review, 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. The Contractor shall not be responsible for the adequacy of the performance and design criteria specified in the Contract Documents.

### § 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, and 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 and patching shall be restored to the condition existing prior to the cutting, fitting and 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 such construction by the Owner or a separate contractor except with written consent of the Owner and of such separate contractor; such consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold from the Owner or a separate contractor the Contractor's 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 or 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 Owner shall be entitled to reimbursement from the Contractor.

### § 3.16 ACCESS TO WORK

The Contractor shall provide the Owner and Architect 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 such 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 the Contractor has reason to believe that the required design, process or product is an infringement of a copyright or a patent, the Contractor shall be responsible for such loss unless such 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 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.

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

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

### § 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, except as provided in Section 3.3.1.

§ 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 report to the Owner (1) known deviations from the Contract Documents and from the most recent construction schedule submitted by the Contractor, and (2) 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 FACILITATING CONTRACT ADMINISTRATION

Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, the Owner and Contractor shall endeavor to communicate with each other through the Architect about matters arising out of or relating to the Contract. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and material suppliers shall be through the Contractor. Communications by and with separate contractors shall be through the Owner.

§ 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 13.5.2 and 13.5.3, whether or not such 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, material and equipment 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, unless otherwise specifically stated by the Architect, of any construction means, methods, techniques, sequences or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may authorize 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 duties, responsibilities and limitations of authority of such project representatives shall be as set forth in an exhibit to be incorporated in the Contract Documents.

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

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

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

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

## ARTICLE 5 SUBCONTRACTORS

### § 5.1 DEFINITIONS

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a separate contractor or 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 or the bidding requirements, the Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner through the Architect the names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each principal portion of the Work. The Architect may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Architect has reasonable objection to any such proposed person or entity or (2) that the Architect requires additional time for review. Failure of the Owner or Architect to reply 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 previously selected if the Owner or Architect makes reasonable objection to such substitution.

### § 5.3 SUBCONTRACTUAL RELATIONS

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

be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

#### § 5.4 CONTINGENT ASSIGNMENT OF SUBCONTRACTS

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

- .1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor in writing; 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 such 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 Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and to award separate contracts in connection with other portions of the Project or other construction or operations on the site under Conditions of the Contract identical or substantially similar to these including those portions related to insurance and waiver of subrogation. If the Contractor claims that delay or additional cost is involved because of such action by the Owner, the Contractor shall make such Claim as provided in Article 15.

§ 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 other separate contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to the 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, the Owner shall be deemed to be subject to the same obligations and to have the same rights that apply to the Contractor under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6 and Articles 10, 11 and 12.

##### § 6.2 MUTUAL RESPONSIBILITY

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

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a separate contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly report to the Architect apparent discrepancies or defects in such other construction that would render it unsuitable for such proper execution and results. Failure of the Contractor so to report 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, except as to defects not then reasonably discoverable.

§ 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 the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or separate contractors as provided in Section 10.2.5.

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

### § 6.3 OWNER'S RIGHT TO CLEAN UP

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

## ARTICLE 7 CHANGES IN THE WORK

### § 7.1 GENERAL

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

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

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

### § 7.2 CHANGE ORDERS

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

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

### § 7.3 CONSTRUCTION CHANGE DIRECTIVES

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

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

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

- .1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
- .2 Unit prices stated in the Contract Documents or subsequently agreed upon;
- .3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or

4 As provided in Section 7.3.7.

§ 7.3.4 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed in a proposed Change Order or Construction Change Directive so that application of such unit prices to quantities of Work proposed will cause substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 7.3.5 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.

§ 7.3.6 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.

§ 7.3.7 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the method and 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 7.3.7 shall be limited to the following:

- 1 Costs of labor, including social security, old age and unemployment insurance, fringe benefits required by agreement or custom, and workers' compensation insurance;
- 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 related to the Work; and
- 5 Additional costs of supervision and field office personnel directly attributable to the change.

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

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

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

#### § 7.4 MINOR CHANGES IN THE WORK

The Architect has authority to order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes will be effected by written order signed by the Architect and shall be binding on the Owner and Contractor.

## 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, prematurely commence operations on the site or elsewhere prior to the effective date of insurance required by Article 11 to be furnished by the Contractor and Owner. The date of commencement of the Work shall not be changed by the effective date of such insurance.

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

### § 8.3 DELAYS AND EXTENSIONS OF TIME

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by an act or neglect of the Owner or Architect, or of an employee of either, or of a separate contractor employed by the Owner; or by changes ordered in the Work; or by labor disputes, fire, unusual delay in deliveries, unavoidable casualties or other causes beyond the Contractor's control; or by delay authorized by the Owner pending mediation and arbitration; or by other causes that the Architect determines may justify delay, then the Contract Time shall be extended by Change Order 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

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.

### § 9.2 SCHEDULE OF VALUES

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit to the Architect, before the first Application for Payment, a schedule of values allocating the entire Contract Sum to the various portions of the Work and prepared in such form and supported by such data to substantiate its accuracy as the Architect may require. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's 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. Such application shall be notarized, if required, and supported by such data substantiating the Contractor's right to payment as the Owner or Architect may require, such as copies of requisitions from Subcontractors and material 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 material supplier, unless such Work has been performed by others whom the Contractor intends to pay.

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

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information and belief, be free and clear of liens, claims, security interests or encumbrances in favor of the Contractor, Subcontractors, material suppliers, or other persons or entities making a claim by reason of having 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 issue to the Owner a Certificate for Payment, with a copy to the Contractor, for such amount as the Architect determines is properly due, or notify the Contractor and Owner in writing of the Architect's reasons for withholding certification in whole or in part as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data comprising the Application for Payment, that, to the best of the Architect's knowledge, information and belief, the Work has progressed to the point indicated and that the quality of the Work is in accordance with the Contract Documents. 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. The issuance of a Certificate for Payment will further constitute a representation that the Contractor is entitled to payment in the amount certified. 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 material 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 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 the above reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.3 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 material or equipment suppliers 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 Architect will reflect such payment on the next Certificate 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 material and equipment 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 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, except as may otherwise be required by law.

§ 9.6.5 Contractor payments to material and equipment 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 and 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, shall create any fiduciary liability or tort liability on the part of the Contractor for breach of trust or shall entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

#### § 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' written 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 shut-down, delay and start-up, plus interest as provided for in the Contract Documents.

#### § 9.8 SUBSTANTIAL COMPLETION

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

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

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

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion, shall establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and shall 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 such Certificate. Upon such acceptance and consent of surety, if any, the Owner shall make payment of retainage applying to such 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 as required under Section 11.3.1.5 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 written 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 and, 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 terms and conditions of 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 and will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner, (3) a written statement that the Contractor knows of no substantial 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 and (5), if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts, 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. If such lien 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 such lien, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed 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 surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

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

- .1 liens, Claims, security interests or encumbrances arising out of the Contract and unsettled;
- .2 failure of the Work to comply with the requirements of the Contract Documents; or
- .3 terms of special warranties required by the Contract Documents.

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

#### ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

##### § 10.1 SAFETY PRECAUTIONS AND PROGRAMS

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

##### § 10.2 SAFETY OF PERSONS AND PROPERTY

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

- .1 employees on the Work and other persons who may be affected thereby;
- .2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody or control of the Contractor or the Contractor's Subcontractors or Sub-subcontractors; 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 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 owners and users of adjacent sites and utilities.

§ 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, except damage or loss 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, written notice of such 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

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials. 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 report the condition to the Owner and Architect in writing.

§ 10.3.2 Upon receipt of the Contractor's written 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 such material or substance or who are to perform the task of removal or safe containment of such 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 in the amount of the Contractor's reasonable additional costs of shut-down, 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 materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for 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 indemnify the Owner for the cost and expense the Owner incurs (1) for remediation of a material or substance 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 indemnify the Contractor for all cost and expense thereby incurred.

#### § 10.4 EMERGENCIES

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

### ARTICLE 11 INSURANCE AND BONDS

#### § 11.1 CONTRACTOR'S LIABILITY INSURANCE

§ 11.1.1 The Contractor shall purchase from and maintain in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located such insurance as will protect the Contractor from claims set forth below which may arise out of or result from the Contractor's operations and completed operations under the Contract and for which the Contractor may be legally liable, whether such operations be by the Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

1. Claims under workers' compensation, disability benefit and other similar employee benefit acts that are applicable to the Work to be performed;
2. Claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees;
3. Claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees;
4. Claims for damages insured by usual personal injury liability coverage;
5. Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom;
6. Claims for damages because of bodily injury, death of a person or property damage arising out of ownership, maintenance or use of a motor vehicle;
7. Claims for bodily injury or property damage arising out of completed operations; and
8. Claims involving contractual liability insurance applicable to the Contractor's obligations under Section 3.18.

§ 11.1.2 The insurance required by Section 11.1.1 shall be written for not less than limits of liability specified in the Contract Documents or required by law, whichever coverage is greater. Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from the date of commencement of the

Work until the date of final payment and termination of any coverage required to be maintained after final payment, and, with respect to the Contractor's completed operations coverage, until the expiration of the period for correction of Work or for such other period for maintenance of completed operations coverage as specified in the Contract Documents.

§ 11.1.3 Certificates of insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work and thereafter upon renewal or replacement of each required policy of insurance. These certificates and the insurance policies required by this Section 11.1 shall contain a provision that coverages afforded under the policies will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner. An additional certificate evidencing continuation of liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment as required by Section 9.10.2 and thereafter upon renewal or replacement of such coverage until the expiration of the time required by Section 11.1.2. Information concerning reduction of coverage on account of revised limits or claims paid under the General Aggregate, or both, shall be furnished by the Contractor with reasonable promptness.

§ 11.1.4 The Contractor shall cause the commercial liability coverage required by the Contract Documents to include (1) the Owner, the Architect and the Architect's consultants as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's completed operations.

#### § 11.2 OWNER'S LIABILITY INSURANCE

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

#### § 11.3 PROPERTY INSURANCE

§ 11.3.1 Unless otherwise provided, 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.

§ 11.3.1.1 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.

§ 11.3.1.2 If the Owner does not intend to purchase such property insurance required by the Contract and with all of the coverages in the amount described above, the Owner shall so inform the Contractor in writing prior to commencement of the Work. The Contractor may then effect insurance that will protect the interests of the Contractor, Subcontractors and Sub-subcontractors in the Work, and by appropriate Change Order the cost thereof shall be charged to the Owner. If the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain insurance as described above, without so notifying the Contractor in writing, then the Owner shall bear all reasonable costs properly attributable thereto.

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

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

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

#### § 11.3.2 BOILER AND MACHINERY INSURANCE

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.

#### § 11.3.3 LOSS OF USE INSURANCE

The Owner, at the Owner's option, may purchase and maintain such insurance as will insure the Owner against loss of use of the Owner's property due to fire or other hazards, however caused. The Owner waives all rights of action against the Contractor for loss of use of the Owner's property, including consequential losses due to fire or other hazards however caused.

§ 11.3.4 If the Contractor requests in writing that insurance for risks other than those described herein or other special causes of loss be included in the property insurance policy, the Owner shall, if possible, include such insurance, and the cost thereof shall be charged to the Contractor by appropriate Change Order.

§ 11.3.5 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, the Owner shall waive all rights in accordance with the terms of Section 11.3.7 for damages caused by fire or other causes of loss covered by this separate property insurance. All separate policies shall provide this waiver of subrogation by endorsement or otherwise.

§ 11.3.6 Before an exposure to loss may occur, the Owner shall file with the Contractor a copy of each policy that includes insurance coverages required by this Section 11.3. Each policy shall contain all generally applicable conditions, definitions, exclusions and endorsements related to this Project. Each policy shall contain a provision that the policy will not be canceled or allowed to expire, and that its limits will not be reduced, until at least 30 days' prior written notice has been given to the Contractor.

#### § 11.3.7 WAIVERS OF SUBROGATION

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, and (2) the Architect, Architect's consultants, separate contractors described in Article 6, 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 covered by property insurance obtained pursuant to this Section 11.3 or other property insurance applicable to the Work, except such rights as they have to proceeds of such insurance held by the Owner as fiduciary. The Owner or Contractor, as appropriate, shall require of the Architect, Architect's consultants, separate contractors described in Article 6, if any, and the subcontractors, sub-subcontractors, agents and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged.

§ 11.3.8 A loss insured under the Owner's property insurance 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 11.3.10. The Contractor shall pay Subcontractors their just shares of insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require Subcontractors to make payments to their Sub-subcontractors in similar manner.

§ 11.3.9 If required in writing by a party in interest, the Owner as fiduciary shall, upon occurrence of an insured loss, give bond for proper performance of the Owner's duties. The cost of required bonds shall be charged against proceeds received as fiduciary. The Owner shall deposit in a separate account proceeds so received, which the Owner shall distribute in accordance with such agreement as the parties in interest may reach, or as determined in accordance with the method of binding dispute resolution selected in the Agreement between the Owner and Contractor. If after such loss no other special agreement is made and unless the Owner terminates the Contract for convenience, replacement of damaged property shall be performed by the Contractor after notification of a Change in the Work in accordance with Article 7.

§ 11.3.10 The Owner as fiduciary shall have power to adjust and settle a loss with insurers unless one of the parties in interest shall object in writing within five days after occurrence of loss to the Owner's exercise of this power; if such objection is made, the dispute shall be resolved in the manner selected by the Owner and Contractor as the method of binding dispute resolution in the Agreement. If the Owner and Contractor have selected arbitration as the method of binding dispute resolution, the Owner as fiduciary shall make settlement with insurers or, in the case of a dispute over distribution of insurance proceeds, in accordance with the directions of the arbitrators.

#### § 11.4 PERFORMANCE BOND AND PAYMENT BOND

§ 11.4.1 The Owner shall have the right to require the Contractor to furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder as stipulated in bidding requirements or specifically required in the Contract Documents on the date of execution of the Contract.

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

### 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, costs of uncovering and replacement shall, by appropriate Change Order, be at the Owner's expense. If such Work is not in accordance with the Contract Documents, such costs and the cost of correction shall be at the Contractor's expense unless the condition was caused by the Owner or a separate contractor in which event the Owner shall be responsible for payment of such costs.

#### § 12.2 CORRECTION OF WORK

##### § 12.2.1 BEFORE OR AFTER SUBSTANTIAL COMPLETION

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, whether discovered before or after 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 an 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 written 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 2.4.

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

§ 12.2.3 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, whether completed or partially completed, of the Owner or separate contractors 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 except that, 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 such 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 such assignment.

#### § 13.3 WRITTEN NOTICE

Written notice shall be deemed to have been duly served if delivered in person to the individual, to a member of the firm or entity, or to an officer of the corporation for which it was intended; or if delivered at, or sent by registered or certified mail or by courier service providing proof of delivery to, the last business address known to the party giving notice.

#### § 13.4 RIGHTS AND REMEDIES

§ 13.4.1 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.

§ 13.4.2 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 there under, except as may be specifically agreed in writing.

#### § 13.5 TESTS AND INSPECTIONS

§ 13.5.1 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 (1) tests, inspections or approvals that do not become requirements until after bids are received or negotiations concluded, and (2) tests, inspections or approvals where building codes or applicable laws or regulations prohibit the Owner from delegating their cost to the Contractor.

§ 13.5.2 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 13.5.1, 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 13.5.3, shall be at the Owner's expense.

§ 13.5.3 If such procedures for testing, inspection or approval under Sections 13.5.1 and 13.5.2 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.

§ 13.5.4 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.

§ 13.5.5 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.

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

#### § 13.6 INTEREST

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at such rate as the parties may 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.

#### § 13.7 TIME LIMITS ON CLAIMS

The Owner and Contractor shall commence all claims and causes of action, whether in contract, tort, breach of warranty or otherwise, against the other arising out of or related to the Contract in accordance with the requirements of the final dispute resolution method selected in the Agreement within the time 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 13.7.

### ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

#### § 14.1 TERMINATION BY THE CONTRACTOR

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

- .1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;

- .2 An act of government, such as a declaration of national emergency that requires all Work to be stopped;
- .3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or
- .4 The Owner has failed to furnish to the Contractor promptly, upon the Contractor's request, reasonable evidence as required by Section 2.2.1.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, 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' written notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, including reasonable overhead and profit, costs incurred by reason of such termination, and damages.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor or a Subcontractor or their agents or employees or any other persons performing portions of the Work under contract with the Contractor because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' written 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 for materials or labor in accordance with the respective agreements between the Contractor and the Subcontractors;
- .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 above reasons exist, the Owner, upon certification by the Initial Decision Maker that sufficient cause exists to justify such action, 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' written 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 as described in Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

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

**§ 14.4 TERMINATION BY THE OWNER FOR CONVENIENCE**

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

§ 14.4.2 Upon receipt of written 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 Contractor shall be entitled to receive payment for Work executed, and costs incurred by reason of such termination, along with reasonable overhead and profit on the Work not executed.

**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, 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.

**§ 15.1.2 NOTICE OF CLAIMS**

Claims by either the Owner or Contractor must be initiated by written 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 must 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 CONTINUING CONTRACT PERFORMANCE**

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. The Architect will prepare Change Orders and issue Certificates for Payment in accordance with the decisions of the Initial Decision Maker.

**§ 15.1.4 CLAIMS FOR ADDITIONAL COST**

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

**§ 15.1.5 CLAIMS FOR ADDITIONAL TIME**

§ 15.1.5.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, written notice as provided herein 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.

§ 15.1.5.2 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.

#### § 15.1.6 CLAIMS FOR CONSEQUENTIAL DAMAGES

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

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

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.6 shall be deemed to preclude an award of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

#### § 15.2 INITIAL DECISION

§ 15.2.1 Claims, excluding those arising under Sections 10.3, 10.4, 11.3.9, and 11.3.10, 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 arising prior to the date final payment is due, unless 30 days have passed after the Claim has been referred to the Initial Decision Maker with no 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 such 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 an initial decision, demand in writing that the other party file for mediation within 60 days of the initial decision. If such a demand is made and the party receiving the demand fails to file for mediation within the time required, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

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

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

### § 15.3 MEDIATION

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.6 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 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. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

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

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

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

### § 15.4.4 CONSOLIDATION OR JOINDER

§ 15.4.4.1 Either party, at its sole discretion, 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 Either party, at its sole discretion, 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 the Owner and Contractor under this Agreement.

## Additions and Deletions Report for AIA® Document A201™ – 2007

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

Note: This Additions and Deletions Report is provided for information purposes only and is not incorporated into or constitute any part of the associated AIA document. This Additions and Deletions Report and its associated document were generated simultaneously by AIA software at 12:04:41 on 02/02/2017.

### PAGE 1

Cedarbrook of Rochester

## Certification of Document's Authenticity

AIA® Document D401™ – 2003

I, James Pappas, AIA, hereby certify, to the best of my knowledge, information and belief, that I created the attached final document simultaneously with its associated Additions and Deletions Report and this certification at 12:04:41 on 02/02/2017 under Order No. 6519031313\_1 from AIA Contract Documents software and that in preparing the attached final document I made no changes to the original text of AIA® Document A201™ – 2007, General Conditions of the Contract for Construction, as published by the AIA in its software, other than those additions and deletions shown in the associated Additions and Deletions Report.

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*(Signed)*

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*(Title)*

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*(Dated)*

## SECTION 01 10 00.03 SUPPLEMENTAL GENERAL CONDITIONS

## PART 1 – GENERAL

The general provisions of the contract, including General Conditions and Division 1, General Requirements, apply to work specified in this section. Wherever the General Conditions are referred to in the specifications, such reference shall be understood to include these Supplemental General Conditions.

1. General Contractor and Subcontractor's Insurance (Refer to General Conditions).

The General Contractor shall not commence work under this contract until he has obtained the insurance required under this paragraph, nor shall the General Contractor permit any Subcontractor to commence work on his subcontract until the insurance required of the Subcontractor has been so obtained.

- a) Workmen's Compensation Insurance: The General Contractor and Subcontractors shall procure and shall maintain during the life of this contract, Workmen's Compensation Insurance for all of his employees to be engaged in work on the project under this contract and in case any such work is sublet, the General Contractor shall require the Subcontractor similarly to provide Workmen's Compensation for all of the latter's employees to be engaged in such work.
- b) General Contractor's and Subcontractors Public Liability and Property Damage Insurance: The General Contractor and Subcontractors shall procure and shall maintain during the life of this contract, General Contractor and Subcontractor Public Liability Insurance in an amount not less than \$1,000,000 for injuries, including accidental death arising out of any one occurrence; and General Contractor's and Subcontractors property damage insurance shall be in an amount not less than \$1,000,000 each occurrence and \$2,000,000 aggregate.

See paragraph c) for "Owner's and Contractor's Protective Public Liability and Property Damage Insurance.

- c) General Contractor's and Subcontractors Motor Vehicle Bodily Injury and Property Damage Insurance: The General Contractor and Subcontractors shall procure and shall maintain during the life of this contract, Motor Vehicle Bodily Injury Insurance (Comprehensive Form) in an amount not less than \$100,000 for injuries, including accidental death arising out of any one occurrence; and property damage in an amount not less than \$2,000,000 for each occurrence.

The General Contractor and Subcontractors shall procure and shall maintain, during the life of this contract, Hired and Non-Ownership Motor Vehicle Bodily Injury and Property Damage Insurance in an amount not less than \$1,000,000 for

injuries, including accidental death arising out of any one occurrence; and property damage in an amount not less than \$2,000,000 for each occurrence.

- d) Proof of Carriage of Insurance: The General Contractor and Subcontractors shall provide the Owner at the time contracts are returned by him for execution, certificates and policies listed below. A guarantee that fifteen (15) days notice to the Owner prior to cancellation of, or change in, any such insurance shall be endorsed on each policy and certificate of insurance.

Four (4) copies of Certificate of Coverage of General Contractor's and Subcontractors Workmen's Compensation Insurance.

Four (4) copies of Certificate of Coverage of General Contractor's and Subcontractors Public Liability and Property Damage Insurance.

Four (4) copies of certificate of Coverage of General Contractor's and Subcontractors Motor Vehicle Bodily Injury and Property Damage Insurance covering Owner, Hired and Non-Owned vehicles.

## **PART 2 – SPECIAL CONIDITIONS**

Substitutions in the specified work shall be covered by the following statement in the Special Conditions: "Material and Workmanship." Unless otherwise specifically provided in this contract, reference to any equipment, material, article, or patented process, by trade name, make, or catalog number, shall be regarded as establishing a standard of quality and shall not be construed as limiting competition. The contractor may, at his option, use any equipment, material, article or process, which, in the judgment of the Owner, is equal to that named. The Contractor shall furnish to the Owner for approval the name of the manufacturer, the model number, and other identifying data and information respecting the performance, capacity, nature, and rating of the machinery and mechanical and other equipment, which the Contractor contemplates incorporating in the work. When required by its contract or when called for by the Owner, the Contractor shall furnish the Owner for approval, full information concerning the material or articles, which the contractor contemplates incorporating into the work. When directed, samples shall be submitted for approval at the Contractor's expense, with all shipping charges prepaid. Machinery, equipment, material, and articles installed or used without required approval shall be at the risk of subsequent rejection.

**END OF SECTION 01 10 00.03**

**SECTION 01 10 00.05 – NGBS GREEN BUILDING CERTIFICATION**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
- B. The requirements in the following NGBS Green Building Certification are hereby made as part of the Specifications and Construction Documents.

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

**PART 3 - EXECUTION (Not Used)**

**END OF SECTION 01 00 00.04**



Overview (Design Phase)

Batch Submission:

**Builder Name:** G. Fisher Construction  
**Physical Address of Home:** 13725 Dexter Ave  
**Community/Lot #:** Cabot Apartments  
**City:** Detroit  
**State:** Michigan  
**County:** Wayne  
**Zip:** 48238

**Climate Zone:**  
 5 Moist

**Radon**  
 3

**Single-Family or Multifamily:** Multifamily  
**Number of Units:** 84  
 No

**Building includes commercial space pursuing Commercial Space certification?**  
**Project Name:** Cabot Apartments

**Total conditioned floor area:** 73225 s.f.  
**Average conditioned floor area:** 872 s.f./unit  
**Stories above grade:** 5

**Year Built:** 1927 (YYYY)  
**Energy Baseline Year:** 1980 (YYYY)  
**Water Baseline Year:** 1980 (YYYY)

When pursuing the performance pathways for energy and water efficiency calculations, baselines can be calculated based on data and building systems that existed in the building up to 3 years prior to project registration.

**Project Description:** Multifamily building remodel  
 Describe overall project, including building characteristics, project timeline, and key renovation efforts.

**Selected Energy Compliance Path:** Performance  
**Selected Water Compliance Path:** Prescriptive  
**Foundation Type:** Slab on grade

**Type of Heating System (main system):** Heat Pump  
**Type of Heating System (system 2):** None  
**Type of Heating System (system 3):** None  
**Primary Heating Fuel:** Electricity  
**Heating Ducts:** Ducted  
**Type of Cooling System (main system):** Heat Pump  
**Type of Cooling System (system 2):** None  
**Type of Cooling System (system 3):** None  
**Cooling Ducts:** Ducted

**Maximum window and door SHGC:** 1 Exclude south-facing  
**Maximum skylight SHGC:** 1 glass if part of "Sun-tempered" design  
**Maximum window and door U-value:** 0.3  
**Maximum skylight U-value:** 0.55 (703.7.1).  
**Renewable Energy:** None  
**Thermal Envelope Insulation:** Fiberglass  
**Attic Type:** None  
**Attached Garage:** No  
**Recessed Lighting:** No

**Special Design Features:**  
**Passive Solar:** No  
**Mass Walls:** No  
**Radiant/Hydronic:** No  
**Tankless Water Heater:** No  
**Composting Toilet:** No

**Local Energy Code:** 2018 IECC  
**Local Building Code:** 2018 IBC

**Who completed this information?** Erik Reading

[CLICK TO PROCEED TO CHAPTER 5 >>](#)

Total Chapter Points: 57
Total Project Points: 183
Total Project Level: Silver
Points Needed to Earn Next Level: 42
Revision Date: 12/11/2024



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Coding

Practice #	Chapter 5: Lot Design, Preparation, and Development	Points Available	Points Claimed	Status	Notes
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**11.500 LOT DESIGN, PREPARATION AND DEVELOPMENT**

**11.500.0** **11.500.0 Intent.** This section applies to the lot and changes to the lot due to remodeling of an existing building.

**11.501 LOT SELECTION**

<b>11.501.2</b>	<b>11.501.2 Multi-modal transportation.</b> A range of multi-modal transportation choices are promoted by one or more of the following:				
(1)	The building is located within one-half mile (805 m) of pedestrian access to a mass transit system.	6	6	<input checked="" type="checkbox"/>	Dexter & Pasadena Bus Stop
(2)	The building is located within five miles (8,046 m) of a mass transit station with provisions for parking.	3	3	<input checked="" type="checkbox"/>	Detroit Amtrak Station 11W Baltimore Ave
(3)	The building is located within one-half mile (805 m) of six or more community resources. No more than two each of the following use category can be counted toward the total: Recreation, Retail, Civic, and Services. Examples of resources in each category include, but are not limited to the following:  Recreation: recreational facilities (such as pools, tennis courts, basketball courts), parks. Retail: grocery store, restaurant, retail store. Civic: post office, place of worship, community center. Services: bank, daycare center, school, medical/dental office, Laundromat/dry cleaners. <b>NOTE: List the 6 community resources in the Notes field.</b> OR A lot is selected within a census block group that, compared to its region, has above-average neighborhood walkability using an index within the EPA's Smart Location Database:	4	4	<input checked="" type="checkbox"/>	Recreation: Zussman Playground Retail: Nicky D's Coney Island, Pop's Place Civic: Parkman Public Library, Dexter Avenue Baptist Community Center Services: Chase Bank
(a)	Walkability is within the top quartile for the region.	5			
(b)	Walkability is within the second quartile for the region.	2			
(4)	The building is on a lot located within a community that has rights-of-way specifically dedicated to bicycle use in the form of paved paths or bicycle lanes, or is on an infill lot located within 1/2 mile of a bicycle lane designated by the jurisdiction.	5	0	<input type="checkbox"/>	
(5)	Dedicated bicycle parking and racks are constructed for mixed-use and multifamily buildings:		0	<input type="checkbox"/>	
(a)	Minimum of 1 bicycle parking space per 3 residential units	2			
(b)	Minimum of 1 bicycle parking space per 2 residential units	4			
(c)	Minimum of 1 bicycle parking space per 1 residential unit.	6			
(d)	Bicycle enclosed storage is provided or parking spaces are covered or otherwise protected from the elements.	2 points per (a) - (c)		<input type="checkbox"/>	
(6)	The remodel includes the new development and implementation of a community scale bike sharing. <b>NOTE: Enter name of the bike sharing program in the Notes field.</b>	3	0	<input type="checkbox"/>	
(7)	The remodel includes the new development and implementation of a community scale motorized vehicle sharing program. <b>NOTE: Enter name of the car sharing program in the Notes field.</b>	5	0	<input type="checkbox"/>	

**11.502 PROJECT TEAM, MISSION STATEMENT, AND GOALS**

<b>11.502.1</b>	<b>11.502.1 Project team, mission statement, and goals.</b> A knowledgeable team is established and team member roles are identified with respect to green lot design, preparation, and development. The project's green goals and objectives are written into a mission statement.	4	4	<input checked="" type="checkbox"/>	
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**11.503 LOT DESIGN**

<b>11.503.0</b>	<b>11.503.0 Intent.</b> The lot is designed to avoid detrimental environmental impacts first, to minimize any unavoidable impacts, and to mitigate for those impacts that do occur. The project is designed to minimize environmental impacts and to protect, restore, and enhance the natural features and environmental quality of the lot.  <b>(Points awarded only if the intent of the design is implemented.)</b>				
<b>11.503.1</b>	<b>11.503.1 Natural resources.</b> Natural resources are conserved by one or more of the following:				
(1)	A natural resources inventory is completed under the direction of a qualified professional.	5	0	<input type="checkbox"/>	
(2)	A plan is implemented to conserve the elements identified by the natural resource inventory as high-priority resources.	6	0	<input type="checkbox"/>	
(3)	Items listed for protection in the natural resource inventory plan are protected under the direction of a qualified professional.	4	0	<input type="checkbox"/>	
(4)	Basic training in tree or other natural resource protection is provided for the on-site supervisor.	4	0	<input type="checkbox"/>	
(5)	All tree pruning on-site is conducted by a certified arborist or other qualified professional.	3	0	<input type="checkbox"/>	
(6)	Ongoing maintenance of vegetation on the lot during construction is in accordance with TCIA A300 or locally accepted best practices.	4	0	<input type="checkbox"/>	
(7)	Where a lot adjoins a landscaped common area, a protection plan from the remodeling construction activities next to the common area is implemented.	5	0	<input type="checkbox"/>	
(8)	Developer has a plan to design and construct the lot in accordance with the International Wildland-Urban Interface Code (IWUIC). [Only applicable where the AHJ has not declared a wildland-urban interface area, but a fire protection engineer, certified fire marshal, or other qualified party has determined and documented the site as hazarded per the IWUIC.]	6	0	<input type="checkbox"/>	
<b>11.503.2</b>	<b>11.503.2 Slope disturbance.</b> Slope disturbance is minimized by one or more of the following: <b>Note: Points are only available for lots with slopes of 25% or greater.</b>				Max Slope in Const. Zn:
(1)	The use of terrain-adaptive architecture.	5	0	<input type="checkbox"/>	
(2)	Hydrological/soil stability study is completed and used to guide the design of any additions to buildings on the lot.	5	0	<input type="checkbox"/>	
(3)	All or a percentage of new driveways and parking are aligned with natural topography to reduce cut and fill.		0	<input type="checkbox"/>	
(a)	10 percent to < 25 percent	1			
(b)	25 percent to 75 percent	4			
(c)	greater than 75 percent	6			
(4)	Long-term erosion effects are reduced through the design and implementation of clustering, terracing, retaining walls, landscaping, or restabilization techniques.	6	0	<input type="checkbox"/>	
(5)	Underground parking uses the natural slope for parking entrances.	5	0	<input type="checkbox"/>	
<b>11.503.3</b>	<b>11.503.3 Soil disturbance and erosion.</b> Soil disturbance and erosion are minimized by one or more of the following: (also see § 11.504.3) <b>Note: Points must be earned in 11.503.3 in order for points in 11.504.1 to be available</b>				
(1)	Remodeling construction activities are scheduled such that disturbed soil that is to be left unworked for more than 21 days is stabilized within 14 days.	2	0	<input type="checkbox"/>	
(2)	The new utilities on the lot are designed to use one or more alternative means:	2	0	<input type="checkbox"/>	
(a)	tunneling instead of trenching			<input type="checkbox"/>	
(b)	use of smaller (low ground pressure) equipment or geomats to spread the weight of construction equipment			<input type="checkbox"/>	
(c)	shared utility trenches or easements			<input type="checkbox"/>	
(d)	placement of utilities under paved surfaces instead of yards			<input type="checkbox"/>	
(3)	Limits of new clearing and grading are demarcated on the lot plan.	5	0	<input type="checkbox"/>	

11.503.4	<p><b>11.503.4 Stormwater Management.</b> The stormwater management system is designed to use low impact development/green infrastructure practices to preserve, restore or mitigate changes in site hydrology due to land disturbance and the construction of impermeable surfaces through the use of one or more of the following techniques:</p> <p>NOTE: For lots in a development, the points for 503.4 may be awarded for the lot when there is a community storm water management plan implemented and the builder does not violate that plan with respect to water leaving the lot.</p>				
(1)	A site assessment is conducted and a plan prepared and implemented that identifies important existing permeable soils, natural drainage ways and other water features, e.g., depressional storage, onsite to be preserved in order to maintain site hydrology.	7	0	<input type="checkbox"/>	
(2)	Low Impact Development/Green Infrastructure stormwater management practices to promote infiltration and evapotranspiration are used to manage rainfall on the lot and prevent the off-lot discharge of runoff from all storms up to and including the volume of following storm events:		0	<input type="checkbox"/>	
(a)	80th percentile storm event	5			
(b)	90th percentile storm event	8			
(c)	95th percentile storm event	10			
(3)	Permeable materials are used for driveways, parking areas, walkways, patios, and recreational surfaces and the like according to the following percentages:		0	<input type="checkbox"/>	
(a)	10 percent to less than 25 percent (add 2 points for use of vegetative paving system)	5			
(b)	25-50 percent (add 4 points for use of vegetative paving system)	8			
(c)	Greater than 50 percent (add 6 points for use of vegetative paving system)	10			
	[Points for vegetative paving systems are only awarded for locations receiving more than 20 inches per year of annual average precipitation.]	0	0	<input type="checkbox"/>	
(4)	Complete gutter and downspout system directs storm water away from foundation to vegetated landscape area, a raingarden, or catchment system that provides for water infiltration.	8	8	<input checked="" type="checkbox"/>	Verify where water discharges
11.503.5	<p><b>11.503.5 Landscape plan.</b> A plan for the lot is developed to limit water and energy use while preserving or enhancing the natural environment.</p> <p>(Where "front" only or "rear" only plan is implemented, only half of the points (rounding down to a whole number) are awarded for items (1)-(8))</p>				Verify
(1)	A plan is formulated and implemented that protects, restores, or enhances natural vegetation on the lot.		0	<input type="checkbox"/>	
(a)	100 percent of the natural area	4			
(b)	50 percent of the natural area	3			
(c)	25 percent of the natural area	2			
(d)	12 percent of the natural area	1			
(2)	Non-invasive vegetation that is native or regionally appropriate for local growing conditions is selected to promote biodiversity.	7	7	<input checked="" type="checkbox"/>	Verify
(3)	To improve pollinator habitat, at least 10 percent of planted areas are composed of native or regionally appropriate flowering and nectar producing plant species. Invasive plant species shall not be utilized.	3	0	<input type="checkbox"/>	
(4)	EPA WaterSense Water Budget Tool or equivalent is used when implementing the site vegetative design.	5	0	<input type="checkbox"/>	
(5)	Where turf is being planted, Turfgrass Water Conservation Alliance (TWCA) or equivalent as determined by the adopting entity third party qualified water efficient grasses are used.	3	0	<input type="checkbox"/>	
(6)	For landscaped vegetated areas, the maximum percentage of all turf areas is:		0	<input type="checkbox"/>	
(a)	0 percent	5			
(b)	Greater than 0 percent to less than 20 percent	4			
(c)	20 percent to less than 40 percent	3			
(d)	40 percent to 60 percent	2			
(7)	Plants with similar watering needs are grouped (hydrozoning) and shown on the lot plan.	5	5	<input checked="" type="checkbox"/>	Verify
(8)	Summer shading by planting installed to shade a minimum of 30 percent of building walls. To conform to summer shading, the effective shade coverage (five years after planting) is the arithmetic mean of the shade coverage calculated at 10 am for eastward facing walls, noon for southward facing walls, and 3 pm for westward facing walls on the summer solstice.	5	0	<input type="checkbox"/>	
(9)	Vegetative wind breaks or channels are designed to protect the lot and immediate surrounding lots as appropriate for local conditions.	5	0	<input type="checkbox"/>	
(10)	Site- or community-generated tree trimmings or stump grinding of regionally appropriate trees are used on the site to provide protective mulch during construction or for landscaping.	3	0	<input type="checkbox"/>	
(11)	An integrated pest management plan is developed to minimize chemical use in pesticides and fertilizers.	4	0	<input type="checkbox"/>	
(12)	Developer has a plan for removal or containment of invasive plants from the disturbed areas of the site.	3	0	<input type="checkbox"/>	
(13)	Developer implements a plan for removal or containment of invasive plants on the undisturbed areas of the site.	6	0	<input type="checkbox"/>	
11.503.6	<p><b>11.503.6 Wildlife habitat.</b> Measures are planned to support wildlife habitat and include at least two of the following:</p>		0		
(1)	Plants and gardens that encourage wildlife, such as bird and butterfly gardens.	3		<input type="checkbox"/>	
(2)	Inclusion of a certified "backyard wildlife" program.	3		<input type="checkbox"/>	
(3)	The lot is adjacent to a wildlife corridor, fish and game park, or preserved areas and is designed with regard for this relationship.	3		<input type="checkbox"/>	
(4)	Outdoor lighting techniques are utilized with regard for wildlife.	3		<input type="checkbox"/>	
11.503.7	<p><b>11.503.7 Environmentally sensitive areas.</b> The lot is in accordance with one or both of the following:</p>		4	<input checked="" type="checkbox"/>	Verify
(1)	The lot does not contain any environmentally sensitive areas that are disturbed during remodeling.	4			
(2)	On lots with environmentally sensitive areas, mitigation and/or restoration is conducted to preserve ecosystem functions lost through remodeling activities.	4			

**11.504 LOT CONSTRUCTION**

11.504.0	<b>11.504.0 Intent.</b> Environmental impact during construction is avoided to the extent possible; impacts that do occur are minimized, and any significant impacts are mitigated.				
11.504.1	<b>11.504.1 On-site supervision and coordination.</b> On-site supervision and coordination is provided during on-the lot clearing, grading, trenching, paving, and installation of utilities to ensure that specified green development practices are implemented. (also see Section 11.503.3)	4	0	<input type="checkbox"/>	
<b>NOTE: Points must be taken in 11.503.3 to claim points in 11.504.1.</b>					
11.504.2	<b>11.504.2 Trees and vegetation.</b> Designated trees and vegetation are preserved by one or more of the following:				
(1)	Fencing or equivalent is installed to protect trees and other vegetation.	3	0	<input type="checkbox"/>	
(2)	Trenching, significant changes in grade, and compaction of soil and critical root zones in all "tree save" areas as shown on the lot plan are avoided.	5	0	<input type="checkbox"/>	
(3)	Damage to designated existing trees and vegetation is mitigated during construction through pruning, root pruning, fertilizing, and watering.	4	0	<input type="checkbox"/>	
11.504.3	<b>11.504.3 Soil disturbance and erosion implementation.</b> On-site soil disturbance and erosion during remodeling are minimized by one or more of the following in accordance with the SWPPP or applicable plan; (also see Section 11.503.3)				
(1)	Sediment and erosion controls are installed on the lot and maintained in accordance with the stormwater pollution prevention plan, where required.	5	0	<input type="checkbox"/>	
(2)	Limits of clearing and grading are staked out on the lot.	5	0	<input type="checkbox"/>	
(3)	"No disturbance" zones are created using fencing or flagging to protect vegetation and sensitive areas on the lot from construction activity.	5	0	<input type="checkbox"/>	
(4)	Topsoil from either the lot or the site development is stockpiled and stabilized for later use and used to establish landscape plantings on the lot.	5	0	<input type="checkbox"/>	
(5)	Soil compaction from construction equipment is reduced by distributing the weight of the equipment over a larger area (laying lightweight geogrids, mulch, chipped wood, plywood, OSB, metal plates, or other materials capable of weight distribution in the pathway of the equipment).	4	0	<input type="checkbox"/>	
(6)	Disturbed areas on the lot that are complete or to be left unworked for 21 days or more are stabilized within 14 days using methods as recommended by the EPA, or in the approved SWPPP, where required.	3	0	<input type="checkbox"/>	
(7)	Soil is improved with organic amendments or mulch.	3	3	<input checked="" type="checkbox"/>	Verify
(8)	Newly installed utilities on the lot are installed using one or more alternative means: tunneling instead of trenching, use of smaller equipment, use of low ground pressure equipment, use of geomats, shared utility trenches or easements, other.	5	0	<input type="checkbox"/>	
<b>NOTE: List "other" means of installing utilities in the assigned Notes area.</b>					

**11.505 INNOVATIVE PRACTICES**

11.505.0	<b>11.505.0 Intent.</b> Innovative lot design, preparation and development practices are used to enhance environmental performance. Waivers or variances from local development regulations are obtained, and innovative zoning is used to implement such practices.				
11.505.1	<b>11.505.1 Driveways and parking areas.</b> Driveways and parking areas are minimized or mitigated by one or more of the following:				
(1)	Off-street parking areas are shared or driveways are shared. Waivers or variances from local development regulations are obtained to implement such practices, if required.	5	0	<input type="checkbox"/>	
(2)	In a multifamily project, parking capacity does not exceed the local minimum requirements.	5	0	<input type="checkbox"/>	
(3)	Structured parking is utilized to reduce the footprint of surface parking areas.		0	<input type="checkbox"/>	
(a)	25 percent to less than 50 percent	4			
(b)	50 percent to 75 percent	5			
(c)	greater than 75 percent	6			
11.505.2	<b>11.505.2 Heat island mitigation.</b> Heat island effect is mitigated by one or both of the following:				
(1)	Hardscape: Not less than 50 percent of the surface area of the hardscape on the lot meets one or a combination of the following methods.	5	0	<input type="checkbox"/>	
(a)	Shading of hardscaping: Shade is provided from existing or new vegetation (within five years) or from trellises. Shade of hardscaping is to be measured on the summer solstice at noon.			<input type="checkbox"/>	
(b)	Light-colored hardscaping: Horizontal hardscaping materials are installed with a solar reflectance index (SRI) of 29 or greater. The SRI is calculated in accordance with ASTM E1980. A default SRI value of 35 for new concrete without added color pigment is permitted to be used instead of measurements.			<input type="checkbox"/>	
(c)	Permeable hardscaping: Permeable hardscaping materials are installed.			<input type="checkbox"/>	
(2)	Roofs: Not less than 75 percent of the exposed surface of the roof is vegetated using technology capable of withstanding the climate conditions of the jurisdiction and the microclimate conditions of the building lot. Invasive plant species are not permitted.	5	0	<input type="checkbox"/>	
11.505.3	<b>11.505.3 Density.</b> The average density on the lot on a net developable area basis is:		8	(5)	84 units / 0.55 acres = 152.73 units per acre
(1)	7 to less than 14 dwelling units per acre (per 4,047 m <sup>2</sup> )	4			
(2)	14 to less than 21 dwelling units per acre (per 4,047 m <sup>2</sup> )	5			
(3)	21 to less than 35 dwelling units per acre (per 4,047 m <sup>2</sup> )	6			
(4)	35 to less than 70 dwelling units per acre (per 4,047 m <sup>2</sup> )	7			
(5)	70 or greater dwelling units per acre (per 4,047 m <sup>2</sup> )	8			
11.505.4	<b>11.505.4 Mixed-use development.</b>				
(1)	The lot contains a mixed-use building.	8	0	<input type="checkbox"/>	
11.505.5	<b>11.505.5 Multifamily or mixed-use community garden(s).</b> Local food production to residents or area consumers.				Community Garden (sf):
(a)	A portion of the lot of at least 250 sq ft is established as community garden(s) for the residents of the site. [*3 points per 250 sq ft]	9 max	0	<input type="checkbox"/>	
(b)	Locate the project within a 0.5-mile walking distance of an existing or planned farmers market/ farm stand that is open or will operate at least once a week for at least five months of the year.	3	0	<input type="checkbox"/>	
(c)	Areas and physical provisions are provided for composting.	1	0	<input type="checkbox"/>	
(d)	Signs designating the garden area are posted.	1	0	<input type="checkbox"/>	
11.505.6	<b>11.505.6 Multi-unit plug-in electric vehicle charging.</b> Plug-in electric vehicle charging capability is provided for not fewer than 2 percent of parking stalls. [An additional 2 points can be earned for each percentage point above 2% for a maximum of 10 points]	4 (10 max)	0	<input type="checkbox"/>	
Fractional values shall be rounded up to the nearest whole number. Electrical capacity in main electric panels supports Level 2 charging (208/240V-up to 80 amps or in accordance with SAE J1772). Each stall is provided with conduit and wiring infrastructure from the electric panel to support Level 2 charging (208/240V- up to 80 amps or in accordance with SAE J1772) service to the designated stalls, and stalls are equipped with either Level 2 charging AC grounded outlets (208/240V- up to 80 amps or in accordance with SAE J1772) or Level 2 charging stations (208-240V/80A) by a third party charging station.					
<b>NOTE: SF/BTR homes are also eligible if 2% or more of the total of shared/communal/visitor parking stalls in the development/community have plug-in electric vehicle charging capability.</b>					

11.505.7	<p><b>11.505.7 Multi-unit residential CNG vehicle fueling.</b> CNG vehicle residential fueling appliances are provided for at least 1 percent of the parking stalls. The CNG fueling appliances shall be listed in accordance with ANSI/CSA NGV 5.1 and installed in accordance to the appliance manufacturer's installation instructions.</p> <p>NOTE: Single-Family/Build-to-Rent homes are also eligible if 1% of the shared/communal/visitor parking stalls in the development have residential CNG vehicle refueling.</p>	4	0	<input type="checkbox"/>		
11.505.8	<p><b>11.505.8 Street network.</b> Project is located in an area of high intersection density.</p>	5	5	<input checked="" type="checkbox"/>	Existing density = 98.06	
11.505.9	<p><b>11.505.9 Smoking prohibitions.</b> Signs are provided on multifamily and mixed-use lots prohibiting smoking at the following locations:</p> <p>NOTE: Build-to-rent homes are also eligible for (a), (b) and (c) if smoking is prohibited and signs posted for all homes in the development/community. SF homes for sale are not eligible.</p>				Build-to-Rent? <input type="checkbox"/>	
	<p>(a) Smoking is prohibited within 25 feet (7.5 m) of all building exterior doors and operable windows or building air intakes within 15 (4.5 m) vertical feet of grade or a walking surface.</p>	3	0	<input type="checkbox"/>		
	<p>(b) Smoking is prohibited on decks, balconies, patios and other occupied exterior spaces.</p>	3	0	<input type="checkbox"/>		
	<p>(c) Smoking is prohibited at all parks, playgrounds, and community activity or recreational spaces.</p>	3	0	<input type="checkbox"/>		
11.505.10	<p><b>11.505.10 Exercise &amp; Recreation Area.</b> For multifamily buildings, on-site dedicated recreation space for exercise or play opportunities for adults and/or children open and accessible to residents is provided.</p>					
	<p>(a) A dedicated area of at least 400 square feet is provided inside the building with adult exercise and/or children's play equipment.</p>	3	0	<input type="checkbox"/>		
	<p>(b) A courtyard, garden, terrace, or roof space at least 10% of the lot area that can serve as outdoor space for children's play and /or adult activities is provided.</p>	3	0	<input type="checkbox"/>		
	<p>(c) Active play/recreation areas are illuminated at night to extend opportunities for physical activity into the evening.</p>	3	0	<input type="checkbox"/>		
11.505.11	<p><b>11.505.11 Battery storage system.</b> A battery storage system of not less than 6 kWh of available capacity is installed that stores electric energy from an on-site renewable electric generation system or is grid-interactive or can perform both functions.</p>	2	0	<input type="checkbox"/>		
<b>END OF CHAPTER 5</b>				<a href="#">CLICK TO PROCEED TO CHAPTER 6 &gt;&gt;</a>		

Total Chapter Points: 58
Total Project Points: 183
Total Project Level: Silver
Points Needed to Earn Next Level: 42
Revision Date: 12/11/2024



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Coding

Practice #	Chapter 6: Resource Efficiency	Points Available	Points Claimed	Status	Notes
<b>11.601 QUALITY OF CONSTRUCTION MATERIALS AND WASTE</b>					
<b>11.601.0</b>	<b>11.601.0 Intent.</b> Design and construction practices that minimize the environmental impact of the building materials are incorporated, environmentally efficient building systems and materials are incorporated, and waste generated during construction is reduced.				
<b>11.601.1</b>	<b>11.601.1 Conditioned floor area.</b> Finished floor area of a dwelling unit or sleeping unit after the remodeling is limited. Finished floor area is calculated in accordance with ANSI Z765 for single family and ANSI/BOMA Z65.4 for multifamily buildings. Only the finished floor area for stories above grade plane is included in the calculation.  (1) less than or equal to 700 square feet (65 m <sup>2</sup> ) <b>14</b> (2) less than or equal to 1,000 square feet (93 m <sup>2</sup> ) <b>12</b> (3) less than or equal to 1,500 square feet (139 m <sup>2</sup> ) <b>9</b> (4) less than or equal to 2,000 square feet (186 m <sup>2</sup> ) <b>6</b> (5) less than or equal to 2,500 square feet (232 m <sup>2</sup> ) <b>3</b> (6) greater than 4,000 square feet (372 m <sup>2</sup> ) <b>N/A</b> <b>(For every 100 square feet (9.29 m<sup>2</sup>) over 4,000 square feet (372 m<sup>2</sup>), one point is to be added the threshold points shown in Table 305.3.7 for each rating level.)</b> <b>Multifamily Building Note:</b> For a multifamily building, a weighted average of the individual unit sizes is used for this practice.	12			
<b>11.601.2</b>	<b>11.601.2 Material usage.</b> Newly installed structural systems are designed or construction techniques are implemented that reduce and optimize material usage. <b>(Points awarded only when the newly installed portion of each structural system comprises at least 25 percent of the total area of that structural system after the remodel)</b> (1) Minimum structural member or element sizes necessary for strength and stiffness in accordance with advanced framing techniques or structural design standards are selected. <b>3</b> <b>0</b> (2) Higher-grade or higher-strength of the same materials than commonly specified for structural elements and components in the building are used and element or component sizes are reduced accordingly. <b>3</b> <b>0</b> (3) Performance-based structural design is used to optimize lateral force-resisting systems. <b>3</b> <b>0</b>				
<b>11.601.3</b>	<b>11.601.3 Building dimensions and layouts.</b> Building dimensions and layouts are designed to reduce material cuts and waste. This practice is used for a minimum of 80 percent of the newly installed areas: <b>(Points awarded only when the newly installed area of the building comprises at least 25 percent of the total area of that element of the building after the remodel)</b> (1) floor area <b>3</b> <b>0</b> (2) wall area <b>3</b> <b>0</b> (3) roof area <b>3</b> <b>0</b> (4) cladding or siding area <b>3</b> <b>0</b> (5) penetrations or trim area <b>1</b> <b>0</b>				
<b>11.601.4</b>	<b>11.601.4 Framing and structural plans.</b> Detailed framing or structural plans, material quantity lists and on-site cut lists for newly installed framing, structural materials, and sheathing materials are provided. <b>4</b> <b>0</b>				
<b>11.601.5</b>	<b>11.601.5 Prefabricated components.</b> Precut or preassembled components, or panelized or precast assemblies are utilized for a minimum of 90 percent for the following system or building: <b>(Points awarded only when the newly installed system comprises at least 25 percent of the total area of that system of the building after the remodel)</b> (1) floor system <b>4</b> <b>0</b> (2) wall system <b>4</b> <b>0</b> (3) roof system <b>4</b> <b>0</b> (4) modular construction for any new construction located above grade <b>13</b> <b>0</b>	13 Max			
<b>11.601.6</b>	<b>11.601.6 Stacked stories.</b> Stories above grade are stacked, such as in 1½-story, 2-story, or greater structures. The area of the upper story is a minimum of 50 percent of the area of the story below based on areas with a minimum ceiling height of 7 feet (2,134 mm). (1) first stacked story <b>4</b> (2) for each additional stacked story <b>2</b>	8 Max	8		from overview: 4+ story bldg.
<b>11.601.7</b>	<b>11.601.7 Prefinished materials.</b> Prefinished building materials or assemblies listed below have no additional site-applied finishing material are installed. <b>(Points awarded for each type of material or assembly.)</b> (a) interior trim not requiring paint or stain (b) exterior trim not requiring paint or stain (c) window, skylight, and door assemblies not requiring paint or stain on one of the following surfaces: i. exterior surfaces ii. interior surfaces (d) interior wall coverings or systems, floor systems, and/or ceiling systems not requiring paint or stain or other type of finishing application (e) exterior wall coverings or systems, floor systems, and/or ceiling systems not requiring paint or stain or other type of finishing application (1) 90 percent or more (after the remodel) of the installed building materials or assemblies listed above: <b>5</b> (2) 50 percent to less than 90 percent (after the remodel) of the installed building material or assembly listed above: <b>2</b> (3) 35 percent to less than 50 percent (after the remodel) of the installed building material or assembly listed above: <b>1</b>	12 Max	12		Verify
<b>11.601.8</b>	<b>11.601.8 Foundations.</b> A foundation system that minimizes soil disturbance, excavation quantities and material usage, such as frost-protected shallow foundations, isolated pier and pad foundations, deep foundations, post foundations, or helical piles is selected, designed, and constructed. The foundation is used on 25 percent or more of the building footprint after the remodel.  <b>NOTE:</b> Indicate in the assigned Notes area the type designed and constructed: frost-protected shallow foundations, pier and pad foundations, post foundations, or other similar foundation type.	3	0		

**11.602 ENHANCED DURABILITY AND REDUCED MAINTENANCE**

<b>11.602.0</b>	<b>11.602.0 Intent.</b> Design and construction practices are implemented that enhance the durability of materials and reduce in-service maintenance.				
<b>11.602.1</b>	<b>11.602.1 Moisture Management – Building Envelope</b>				
<b>11.602.1.1</b>	<b>11.602.1.1 Capillary breaks</b>				
<b>11.602.1.1.1</b>	<b>11.602.1.1.1</b> Capillary breaks A capillary break and vapor retarder are installed at concrete slabs in accordance with ICC IRC Sections R506.2.2 and R506.2.3 or ICC IBC Sections 1907 and 1805.4.1. <b>This practice is not mandatory for existing slabs without apparent moisture problem.</b>	Mandatory		N/A	Verify not altering
<b>11.602.1.1.2</b>	<b>11.602.1.1.2</b> A capillary break to prevent moisture migration into foundation wall is provided between the footing and the foundation wall on all new foundations, and on not less than 25 percent of the total length of the foundation after the remodel.	3	0		
<b>11.602.1.2</b>	<b>11.602.1.2 Foundation waterproofing.</b> Enhanced foundation waterproofing is installed on all new foundations, and on not less than 25 percent of the total length of the foundation after the remodel using one or both of the following:	4	0		
(1)	rubberized coating, or				
(2)	drainage mat				
<b>11.602.1.3</b>	<b>11.602.1.3 Foundation drainage</b>				
<b>11.602.1.3.1</b>	<b>11.602.1.3.1</b> Where required by the ICC IRC or IBC for habitable and usable spaces below grade, exterior drain tile is installed. <b>This practice is not mandatory for existing space without apparent moisture problem.</b>	N/A			
<b>11.602.1.3.2</b>	<b>11.602.1.3.2</b> Interior and exterior foundation perimeter drains are installed and sloped to discharge to daylight, dry well, or sump pit on all new foundations and not less than 25 percent of the total length of the foundation after the remodel.	4	0		
<b>11.602.1.4</b>	<b>11.602.1.4 Crawspaces</b>				
<b>11.602.1.4.1</b>	<b>11.602.1.4.1</b> Vapor retarder for all new unconditioned vented crawspace foundations and not less than 25 percent of the total area after the remodel is in accordance with the following, as applicable. Joints of vapor retarder overlap a minimum of 6 inches (152 mm) and are taped.				
(1)	Floors. Minimum 6 mil vapor retarder installed on the crawspace floor and extended at least 6 inches up the wall and is attached and sealed to the wall.	6	0		
(2)	Walls. Dampproof walls are provided below finished grade. <b>This practice is not mandatory for existing walls without apparent moisture problem.</b>	N/A			
<b>11.602.1.4.2</b>	<b>11.602.1.4.2</b> For all new foundations and not less than 25 percent of the total area of the crawspace after the remodel, crawspace that is built as a conditioned area is sealed to prevent outside air infiltration and provided with conditioned air at a rate not less than 0.02 cfm (.009 L/s) per square foot of horizontal area and one of the following is implemented:				
(1)	a concrete slab over 6 mil polyethylene sheeting. Or other Class I vapor retarder installed in accordance with Section 408.3 or Section 506 of the International Residential Code	8	0		
(2)	6 mil polyethylene sheeting, or other Class I vapor retarder installed in accordance with Section 408.3 or Section 506 of the International Residential Code <b>This practice is not mandatory for existing foundations without apparent moisture problem.</b>	N/A			
<b>11.602.1.5</b>	<b>11.602.1.5 Termite barrier.</b> Continuous physical foundation termite barrier provided: <a href="#">See Figure 6(3)</a>				termite infest. prob.:
(1)	In geographic areas that have moderate to heavy infestation potential in accordance with figure 6(3), a no or low toxicity treatment is also installed.	4	0		
(2)	In geographic areas that have a very heavy infestation potential in accordance with figure 6(3), in addition a low toxicity bait and kill termite treatment plan is selected and implemented.	4	0		
<b>11.602.1.6</b>	<b>11.602.1.6 Termite-resistant materials.</b> In areas of termite infestation probability as defined by Figure 6(3), termite-resistant materials are used as follows: <a href="#">See Figure 6(3)</a>				
(1)	In areas of slight to moderate termite infestation probability: for the foundation, all structural walls, floors, concealed roof spaces not accessible for inspection, exterior decks, and exterior claddings within the first 2 feet (610 mm) above the top of the foundation.	2	0		
(2)	In areas of moderate to heavy termite infestation probability: for the foundation, all structural walls, floors, concealed roof spaces not accessible for inspection, exterior decks, and exterior claddings within the first 3 feet (914 mm) above the top of the foundation.	4	0		
(3)	In areas of very heavy termite infestation probability: for the foundation, all structural walls, floors, concealed roof spaces not accessible for inspection, exterior decks, and exterior claddings.	6	0		
<b>11.602.1.7</b>	<b>11.602.1.7 Moisture control measures</b>				
<b>11.602.1.7.1</b>	<b>11.602.1.7.1</b> Moisture control measures are in accordance with the following:				
(1)	Building materials with visible mold are not installed or are cleaned or encapsulated prior to concealment and closing.	2	0		
(2)	Insulation in cavities is dry in accordance with manufacturer's instructions when enclosed (e.g., with drywall). <b>NOTE: if "N/A" is selected, explain why in the assigned Notes area.</b>	Mandatory 2	0	N/A	Verify not altering
(3)	The moisture content of lumber is sampled to ensure it does not exceed 19 percent prior to the surface and/or cavity enclosure.	4	0		
<b>11.602.1.7.2</b>	<b>11.602.1.7.2</b> Moisture content of subfloor, substrate, or concrete slabs is in accordance with the appropriate industry standard for the finish flooring to be applied.	2	0		
<b>11.602.1.7.3</b>	<b>11.602.1.7.3</b> Building envelope assemblies are designed for moisture control based on documented hygrothermal simulation or field study analysis. Hygrothermal analysis is required to incorporate representative climatic conditions, interior conditions and include heating and cooling seasonal variation.	4	0		
<b>11.602.1.8</b>	<b>11.602.1.8 Water-resistive barrier.</b> Where required by the ICC, IRC, or IBC, a water-resistive barrier and/or drainage plane system is installed behind newly installed exterior veneer and/or siding and where there is evidence of a moisture problem. <b>NOTE: if "N/A" is selected, explain why in the assigned Notes area.</b>	Mandatory		N/A	Verify not altering

11.602.1.9	<p><b>11.602.1.9 Flashing.</b> Flashing is provided as follows to minimize water entry into wall and roof assemblies and to direct water to exterior surfaces or exterior water-resistive barriers for drainage. Flashing details are provided in the construction documents and are in accordance with the fenestration manufacturer's instructions, the flashing manufacturer's instructions, or as detailed by a registered design professional.</p> <p><b>Points awarded only when practices (2)-(7) are implemented in all newly installed construction and not less than 25 percent of the applicable building elements for the entire building after the remodel.</b></p>								
(1)	<p>Flashing is installed at all of the following locations, as applicable:</p> <p>(a) around exterior fenestrations, skylights, and doors</p> <p>(b) at roof valleys</p> <p>(c) at all building-to-deck, -balcony, -porch, and -stair intersections</p> <p>(d) at roof-to-wall intersections, at roof-to-chimney intersections, at wall-to-chimney intersections, and at parapets</p> <p>(e) at ends of and under masonry, wood, or metal copings and sills</p> <p>(f) above projecting wood trim</p> <p>(g) at built-in roof gutters, and</p> <p>(h) drip edge is installed at eave and rake edges.</p> <p><b>These practices are not mandatory for existing building elements without apparent moisture problem.</b></p>	Mandatory			Met	A.511 new windows A.511 new doors			
(2)	All window and door head and jamb flashing is either self-adhered flashing complying with AAMA 711-13 or liquid applied flashing complying with AAMA 714-15 and installed in accordance with fenestration or flashing manufacturer's installation instructions.		2	0	<input type="checkbox"/>				
(3)	Pan flashing is installed at sills of all exterior windows and doors.		3	0	<input type="checkbox"/>				
(4)	Seamless, preformed kickout flashing, or prefabricated metal with soldered seams is provided at all roof-to-wall intersections. The type and thickness of the material used for roof flashing including but not limited kickout and step flashing is commensurate with the anticipated service life of the roofing material.		3	0	<input type="checkbox"/>				
(5)	A rainscreen wall design as follows is used for exterior wall assemblies			0	<input type="checkbox"/>				
(a)	a system designed with minimum 1/4-inch air space exterior to the water-resistive barrier, vented to the exterior at top and bottom of the wall, and integrated with flashing details. OR		4						
(b)	a cladding material or a water-resistive barrier with enhanced drainage, meeting 75 percent drainage efficiency determined in accordance with ASTM E2273.		2						
(6)	Through-wall flashing is installed at transitions between wall cladding materials or wall construction types.		2	0	<input type="checkbox"/>				
(7)	Flashing is installed at expansion joints in stucco walls.		2	0	<input type="checkbox"/>				
11.602.1.10	<p><b>11.602.1.10 Exterior doors.</b> Entries at exterior door assemblies, inclusive of side lights (if any), are covered by one of the following methods to protect the building from the effects of precipitation and solar radiation. Either a storm door or a projection factor of 0.375 minimum is provided. Eastern- and western-facing entries in Climate Zones 1, 2, and 3, as determined in accordance with Figure 6(1) or Appendix A, have either a storm door or a projection factor of 1.0 minimum, unless protected from direct solar radiation by other means (e.g., screen wall, awning).</p> <p>This Project's Climate Zone: 5</p> <p>(a) installing a porch roof or awning</p> <p>(b) extending the roof overhang</p> <p>(c) recessing the exterior door</p> <p>(d) installing a storm door</p> <p>Note: The pedestrian door protected in a garage leading to living space does not qualify for points.</p>			2 per exterior door 6 Max	0				
11.602.1.11	<p><b>11.602.1.11 Tile backing materials.</b> Tile backing materials installed under tiled surfaces in wet areas are in accordance with ASTM C1178, C1278, C1288, or C1325.</p> <p><b>This practice is not mandatory for existing tile surfaces without apparent moisture problem.</b></p>	Mandatory			N/A	A.511 note 12C, surrounds			
11.602.1.12	<p><b>11.602.1.12 Roof overhangs.</b> Roof overhangs, in accordance with Table 602.1.12, are provided over a minimum of 90 percent of exterior walls to protect the building envelope.</p> <p>See Table 602.1.12</p>		4	0	<input type="checkbox"/>				
11.602.1.13	<p><b>11.602.1.13 Ice barrier.</b> In areas where there has been a history of ice forming along the eaves causing a backup of water, an ice barrier is installed in accordance with the ICC IRC or IBC at roof eaves of pitched roofs and extends a minimum of 24 inches (610 mm) inside the exterior wall line of the building.</p>	Mandatory			N/A	A.201 flat roof			
11.602.1.14	<p><b>11.602.1.14 Architectural features.</b> Architectural features that increase the potential for water intrusion are avoided:</p>								
(1)	All horizontal ledgers are sloped away to provide gravity drainage as appropriate for the application.	Mandatory 1		1	Met	A.109 note 4 roof slopes			
(2)	No roof configurations that create horizontal valleys in roof design.		2	2	<input checked="" type="checkbox"/>	A.109 note 4 roof slopes			
(3)	No recessed windows and architectural features that trap water on horizontal surfaces.		2	2	<input checked="" type="checkbox"/>	A.712 detail 11			
11.602.1.15	<p><b>11.602.1.15 Kitchen and vanity cabinets.</b> All kitchen and vanity cabinets are certified in accordance with the ANSI/KCMA A161.1 performance standard or equivalent.</p> <p>NOTE: Identify what product was used in the assigned Notes area.</p>		2	0	<input type="checkbox"/>				
11.602.2	<p><b>11.602.2 Roof surfaces.</b> A minimum of 90 percent of roof surfaces, not used for roof penetrations and associated equipment, on-site renewable energy systems such as photovoltaics or solar thermal energy collectors, or rooftop decks, amenities and walkways, are constructed of one or more of the following:</p>		3	0					
(1)	products that are in accordance with the ENERGY STAR® cool roof certification or equivalent				<input type="checkbox"/>				
(2)	a vegetated roof system				<input type="checkbox"/>				
(3)	Minimum initial SRI of 78 for low-sloped roof (a slope less than 2:12) and a minimum initial SRI of 29 for a steep-sloped roof (a slope equal to or greater than 2:12). The SRI is calculated in accordance with ASTM E1980. Roof products are certified and labeled.				<input type="checkbox"/>				
11.602.3	<p><b>11.602.3 Roof water discharge.</b> A gutter and downspout system or splash blocks and effective grading are provided to carry water a minimum of 5 feet (1524 mm) away from perimeter foundation walls.</p>		4	4	<input checked="" type="checkbox"/>	Verify where water discharges			
11.602.4	<p><b>11.602.4 Finished grade.</b></p>								
11.602.4.1	<p><b>11.602.4.1</b> Finished grade at all sides of a building is sloped to provide a minimum of 6 inches (150 mm) of fall within 10 feet (3048 mm) of the edge of the building. Where lot lines, walls, slopes, or other physical barriers prohibit 6 inches (152 mm) of fall within 10 feet (3048 mm), the final grade is sloped away from the edge of the building at a minimum slope of 2 percent.</p>	Mandatory			N/A	Verify existing grading not to be altered			
11.602.4.2	<p><b>11.602.4.2</b> The final grade is sloped away from the edge of the building at a minimum slope of 5 percent.</p>		1	0	<input type="checkbox"/>				
11.602.4.3	<p><b>11.602.4.3</b> Water is directed to drains or swales to ensure drainage away from the structure.</p>		1	0	<input type="checkbox"/>				

**11.603 REUSED OR SALVAGED MATERIALS**

<b>11.603.0</b>	<b>11.603.0 Intent.</b> Practices that reuse or modify existing structures, salvage materials for other uses, or use salvaged materials in the building's construction are implemented.				
<b>11.603.1</b>	<b>11.603.1 Reuse of existing building.</b> Major elements or components of existing buildings and structures are reused, modified, or deconstructed for later use.  (Points awarded for every 200 square feet (18.5 m <sup>2</sup> ) of floor area.) NOTE: Describe materials used in the assigned Notes area. Materials, elements, or components awarded points under Section 11.603.1 shall not be awarded points under Section 11.603.2.	1 12 Max	12	10000 square feet	Reusing existing total building square footage
<b>11.603.2</b>	<b>11.603.2 Salvaged materials.</b> Reclaimed and/or salvaged materials and components are used. The total material value and labor cost of salvaged materials is equal to or exceeds 1 percent of the total construction cost.  (Points awarded per 1% of salvaged materials used based on the total construction cost.) NOTE: Describe materials used in the assigned Notes area. Materials, elements, or components awarded points under Section 11.603.1 shall not be awarded points under Section 11.603.2.	1 9 Max	0		
<b>11.603.3</b>	<b>11.603.3 Scrap materials.</b> Sorting and reuse of scrap building material is facilitated (e.g., a central storage area or dedicated bins are provided). NOTE: Indicate in the assigned Notes area what salvage materials were sorted for reuse.	4	0		

**11.604 RECYCLED-CONTENT BUILDING MATERIALS**

<b>11.604.1</b>	<b>11.604.1 Recycled content.</b> Building materials with recycled content are used for two minor and/or two major components of the building. Enter material percent recycled content. See Table 11.604.1 NOTE: In the assigned Notes area, list materials used for minor and/or major building components.	per Table 604.1	0	First Minor Comp.:	
				Second Minor Comp.:	
				First Major Comp.:	
				Second Major Comp.:	

**11.605 RECYCLED CONSTRUCTION WASTE**

<b>11.605.0</b>	<b>11.605.0 Intent.</b> Waste generated during construction is recycled.				
<b>11.605.1</b>	<b>11.605.1 Hazardous waste.</b> The construction waste management plan shall include information on the proper handling and disposal of hazardous waste. Hazardous waste is properly handled and disposed.	Mandatory		Met	Verify
<b>11.605.2</b>	<b>11.605.2 Construction waste management plan.</b> A construction waste management plan is developed, posted at the jobsite, and implemented diverting through methods such as reuse, salvage, recycling, or manufacturer reclamation, a minimum of 50 percent (by weight) of nonhazardous construction and demolition waste from disposal. For this practice, land clearing debris is not considered a construction waste. Materials used as alternative daily cover are considered construction waste and do not count toward recycling or salvaging.  For remodeling projects or demolition of an existing facility, the waste management plan includes the recycling of 95 percent of electronic waste components (such as printed circuit boards from computers, building automation systems, HVAC, fire and security control boards) by an E-Waste recycling facility.  Exceptions: (1) Waste materials generated from land clearing, soil and sub-grade excavation and vegetative debris shall not be in the calculations. (2) A recycling facility (traditional or E-Waste) offering material receipt documentation is not available within 50 miles of the jobsite.	6	0		
<b>11.605.3</b>	<b>11.605.3 On-site recycling.</b> On-site recycling measures following applicable regulations and codes are implemented, such as the following: (a) Materials are ground or otherwise safely applied on-site as soil amendment or fill. A minimum of 50 percent (by weight) of construction and land-clearing waste is diverted from landfill.  (b) Alternative compliance methods approved by the Adopting Entity. (c) Compatible untreated biomass material (lumber, posts, beams, etc.) are set aside for combustion if a solid fuel-burning appliance per Section 11.901.2.1(2) will be available for on-site renewable energy.	7	0		
<b>11.605.4</b>	<b>11.605.4 Recycled construction materials.</b> Construction materials (e.g., wood, cardboard, metals, drywall, plastic, asphalt roofing shingles, or concrete) are recycled offsite. (1) a minimum of two types of materials are recycled (2) for each additional recycled material type (a) wood (b) cardboard (c) metals (d) drywall (e) plastic (f) asphalt roofing shingles (g) concrete (h) other (i) other NOTE: List "other" types of materials recycled in the assigned Notes area.	6 Max	0		

**11.606 RENEWABLE MATERIALS**

<b>11.606.0</b>	<b>11.606.0 Intent:</b> Building materials derived from renewable resources are used.			
<b>11.606.1</b>	<b>11.606.1 Biobased products.</b> The following biobased products are used:			
	(a) certified solid wood in accordance with Section 11.606.2			
	(b) engineered wood			
	(c) bamboo			
	(d) cotton	0		
	(e) cork			
	(f) straw			
	(g) natural fiber products made from crops (soy-based, corn-based)			
	(h) other biobased materials with a minimum of 50 percent biobased content (by weight or volume)			
	<b>Note:</b> Please list "other biobased materials" used in the Notes field			
(1)	Two types of biobased materials are used, each for more than 0.5 percent of the project's projected building material cost.	3		
(2)	Two types of biobased materials are used, each for more than 1 percent of the project's projected building material cost.	6		
(3)	For each additional biobased material used for more than 0.5 percent of the project's projected building material cost.	1		
		<b>2 Max</b>		
<b>11.606.2</b>	<b>11.606.2 Wood-based products.</b> Wood or wood-based products are certified to the requirements of one of the following recognized product programs:			
	(a) American Forest Foundation's <i>American Tree Farm System</i> ® (ATFS)			
	(b) Canadian Standards Association's <i>Sustainable Forest Management System Standards</i> (CSA 2809)			
	(c) Forest Stewardship Council (FSC)			
	(d) Program for Endorsement of Forest Certification Systems (PEFC)			
	(e) Sustainable Forestry Initiative @ Program (SFI)			
	(f) National Wood Flooring Association's Responsible Procurement Program (RPP)			
	(g) other product programs mutually recognized by PEFC			
	(h) A manufacturer's fiber procurement system that has been audited by an approve agency as compliant with the provisions of ASTM D7612 as a responsible or certified source. Government or tribal forestlands whose water protection programs have been evaluated by an approved agency as compliant with the responsible source designation of ASTM D7612 are exempt from auditing in the manufacturer's fiber procurement system.			
(1)	A minimum of two responsible or certified wood-based products are used for minor components of the building.	3	0	Program(s):
	<b>Note:</b> Please list products and components in the Notes fields			
(2)	A minimum of two responsible or certified wood-based products are used in major components of the building.	4	0	
	<b>Note:</b> Please list products and components in the Notes fields			
<b>11.606.3</b>	<b>11.606.3 Manufacturing energy.</b> Materials manufactured using a minimum of 33 percent of the primary manufacturing process energy derived from (1) renewable sources, (2) combustible waste sources, or (3) renewable energy credits (RECs) are used for major components of the building.	6 Max	0	
	<b>(2 points awarded per material.)</b>			
	<b>Note:</b> Please list materials in the Notes field			

**11.607 RECYCLING AND WASTE REDUCTION**

<b>11.607.1</b>	<b>11.607.1 Recycling and composting.</b> Recycling and composting by the occupant are facilitated by one or more of the following methods:			
(1)	A readily accessible space(s) for recyclable material containers is provided and identified on the floorplan of the house or dwelling unit or a readily accessible area(s) outside the living space is provided for recyclable material containers and identified on the site plan for the house or building. The area outside the living space shall accommodate recycling bin(s) for recyclable materials accepted in local recycling programs	3	0	<input type="checkbox"/>
(2)	A readily accessible space(s) for compostable material containers is provided and identified on the floorplan of the house or dwelling unit or a readily accessible area(s) outside the living space is provided for compostable material containers and identified on the site plan for the house or building. The area outside the living space shall accommodate composting container(s) for locally accepted materials, or, accommodate composting container(s) for on-site composting.	4	0	<input type="checkbox"/>
<b>11.607.2</b>	<b>11.607.2 Food waste disposers.</b> A minimum of one food waste disposer is installed at the primary kitchen sink.	1	1	<input checked="" type="checkbox"/> A.511 note 11c

**11.608 RESOURCE-EFFICIENT MATERIALS**

<b>11.608.1</b>	<b>11.608.1 Resource-efficient materials.</b> Products containing fewer materials are used to achieve the same end-use requirements as conventional products, including but not limited to:	9 Max 3 per material	0	
(1)	lighter, thinner brick with bed depth less than 3 inches and/or brick with coring of more than 25 percent			
(2)	engineered wood or engineered steel products			
(3)	roof or floor trusses			
	<b>NOTE:</b> In the assigned Notes area, describe the types of products that comply with 11.608.1.			

**11.609 REGIONAL MATERIALS**

<b>11.609.1</b>	<b>11.609.1 Regional materials.</b> Regional materials are used for major and/or minor components of the building.	10 Max		
(1)	Major component	2 per each component	0	# of major components:
(2)	Minor component	1 per each component		# of minor components:
	<b>For a component to comply with this practice, a minimum of 75 percent of all products in that component category must be sourced regionally, e.g., stone veneer category – 75 percent or more of the stone veneer on a project must be sourced regionally.</b>			
	<b>NOTE:</b> In the assigned Notes areas, list major and minor materials used that comply with 11.609.1.			

**11.610 LIFE CYCLE ASSESSMENT**

11.610.1	<p><b>11.610.1 Life cycle assessment.</b> A life cycle assessment (LCA) tool is used to select environmentally preferable products, assemblies, or, entire building designs. Points are awarded in accordance with Section 11.610.1.1 or 11.610.1.2. Only one method of analysis or tool may be utilized. The reference service life for the building is 60 years for any life cycle analysis tool. Results of the LCA are reported in the manual required in Section 11.1001.1 or 11.1002.1(1) of this Standard in terms of the environmental impacts listed in this practice and it is stated if association scores were included in the LCA.</p> <p><b>NOTE: Identify the LCA tool utilized and the person who completed the analysis.</b></p>	
11.610.1.1	<p><b>11.610.1.1 Whole-building life cycle assessment.</b> A whole-building LCA is performed in conformance with ASTM E2921 using ISO14044 compliant life cycle assessment.</p> <p>(1) Execute LCA at the whole building level through a comparative analysis between the final and reference building designs as set forth under Standard Practice, ASTM E2921. The assessment criteria includes the following environmental impact categories:</p> <p>(a) Primary energy use                  (b) Global warming potential 8 0                  (c) Acidification potential                  (d) Eutrophication potential                  (e) Ozone depletion potential                  (f) Smog potential</p> <p>(2) Execute LCA on regulated loads throughout the building operations life cycle stage. Conduct simulated energy performance analyses in accordance with Section 702.2.1 ICC IECC analysis (IECC Section 405) in establishing the comparative performance of final versus reference building designs. Primary energy use savings and global warming potential avoidance from simulation analyses results are determined using energy supplier, utility, or EPA electricity generation and other fuels energy conversion factors and electricity generation and other fuels emission rates for the locality or Sub-Region in which the building is located</p> <p>(3) Execute full LCA, including use-phase, through calculation of operating energy impacts (c) – (f) using local or regional emissions factors from energy supplier, utility, or EPA.</p>	<p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p>
11.610.1.2	<p><b>11.610.1.2 Life cycle assessment for a product or assembly.</b> An environmentally preferable product or assembly is selected for an application based upon the use of an LCA tool that incorporates data methods compliant with ISO 14044 or other recognized standards that compare the environmental impact of products or assemblies.</p> <p>10 Max 0</p>	
11.610.1.2.1	<p><b>11.610.1.2.1 Product LCA.</b> A product with improved environmental impact measures compared to another product(s) intended for the same use is selected. The environmental impact measures used in the assessment are selected from the following:</p> <p>(a) Primary energy use                  (b) Global warming potential                  (c) Acidification potential                  (d) Eutrophication potential                  (e) Ozone depletion potential                  (f) Smog potential</p> <p>(Points are awarded for each product/system comparison where the selected product/system improved upon the environmental impact measures by an average of 15 percent.)</p> <p><b>NOTE: List products/systems compared &amp; impact measures considered in the assigned Notes area.</b></p>	<p># of comparisons with 4 measures:</p> <p># of comparisons with 5 measures:</p>
11.610.1.2.2	<p><b>11.610.1.2.2 Assembly LCA.</b> An assembly with improved environmental impact measures compared to a functionally comparable assembly is selected. The full life cycle, from resource extraction to demolition and disposal (including but not limited to on-site construction, maintenance and replacement, material and product embodied acquisition, and process and transportation energy), is assessed. The assessment does not include electrical and mechanical equipment and controls, plumbing products, fire detection and alarm systems, elevators, and conveying systems. The following functional building elements are eligible for points under this practice:</p> <p>(a) exterior walls                  (b) roof/ceiling                  (c) interior walls or ceilings                  (d) intermediate floors</p> <p>The environmental impact measures used in the assessment are selected from the following:</p> <p>(a) Primary energy use                  (b) Global warming potential                  (c) Acidification potential                  (d) Eutrophication potential                  (e) Ozone depletion potential                  (f) Smog potential</p> <p>(Points are awarded based on the number of functional building elements that improve upon environmental impact measures by an average of 15 percent.)</p> <p><b>NOTE: List assemblies compared &amp; impact measures considered in the assigned Notes area.</b></p>	<p>exterior walls:</p> <p>roof/ceiling:</p> <p>int. walls or ceilings:</p> <p>intermediate floors:</p>
<p><b>11.611 PRODUCT DECLARATIONS</b></p>		
11.611.1	<p><b>11.611.1 Product declarations.</b> A minimum of 10 different products installed in the building project, at the time of certificate of occupancy, comply with one of the following sub-sections. Declarations, reports, and assessments are submitted and contain documentation of the critical peer review by an independent third party, results from the review, the reviewer's name, company name, contact information, and date of the review.</p> <p>5 0</p>	
11.611.1.1	<p><b>11.611.1.1 Industry-wide declaration.</b> A Type III industry-wide environmental product declaration (EPD) is submitted for each product. Where the program operator explicitly recognizes the EPD as representative of the product group on a National level, it is considered industry-wide. In the case where an industry-wide EPD represents only a subset of an industry group, as opposed to being industry-wide, the manufacturer is required to be explicitly recognized as a participant by the EPD program operator. All EPDs are required to be consistent with ISO Standards 14025 and 21930 with at least a cradle-to-gate scope. [Each product complying with Section 611.4.1 shall be counted as one product for compliance with Section 611.4]</p> <p><b>NOTE: List products in the assigned Notes area.</b></p>	<p># of products:</p>
11.611.1.2	<p><b>11.611.1.2 Product Specific Declaration.</b> A product specific Type III EPD are submitted for each product. The product specific declaration shall be manufacturer specific for an individual product or product family. All Type III EPDs are required to be certified as complying, at a minimum, with the goal and scope for the cradle-to-gate requirements in accordance with ISO Standards 14025 and 21930. [Each product complying with Section 611.4.2 shall be counted as two products for compliance with Section 611.4.1]</p> <p><b>NOTE: List products in the assigned Notes area.</b></p>	<p># of products (not effective number):</p>

**11.612 INNOVATIVE PRACTICES**

11.612.1	<p><b>11.612.1 Manufacturer's environmental management system concepts.</b> Product manufacturer's operations and business practices include environmental management system concepts, and the production facility is registered to ISO 14001 or equivalent. The aggregate value of building products from registered ISO 14001 or equivalent production facilities is 1 percent or more of the estimated total building materials cost.</p> <p style="text-align: right;"><b>10 Max</b>      0</p> <p style="text-align: center;">(1 point awarded per percent.)</p> <p>NOTE: In the assigned Notes area, list products that comply with 610.1, manufacturers, and ISO registrars.</p>		
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11.612.2	<p><b>11.612.2 Sustainable products.</b> One or more of the following products are used for at least 30% of the floor or wall area of the entire dwelling unit or sleeping unit, as applicable. Products are certified by a third-party agency accredited to ISO 17065.</p> <p>(1) 50% or more of carpet installed (by square feet) is certified to NSF 140 or equivalent.      3</p> <p>(2) 50% or more of resilient flooring installed (by square feet) is certified to NSF 332 or equivalent.      3</p> <p>(3) 50% or more of the insulation installed (by square feet) is certified to UL 2985 or equivalent.      3</p> <p>(4) 50% or more of interior wall coverings installed (by square feet) is certified to NSF 342 or equivalent.      3</p> <p>(5) 50% or more of the gypsum board installed (by square feet) is certified to UL 100 or equivalent.      3</p> <p>(6) 50% or more of the door leaves installed (by number of door leaves) is certified to UL 102 or equivalent.      3</p> <p>(7) 50% or more of the tile installed (by square feet) is certified to TCNA A138.1 Specifications for Sustainable Ceramic Tiles, Glass Tiles and Tile Installation Materials or equivalent.      3</p>	<p>9 Max      0</p>	<p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p>
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11.612.3	<p><b>11.612.3 Universal design elements.</b> Dwelling incorporates one or more of the following universal design elements. Conventional industry construction tolerances are permitted.</p> <p>(1) Any no-step entrance into the dwelling which (1) is accessible from a substantially level parking or drop-off area (no more than 2%) via an accessible path which has no individual change in elevation or other obstruction of more than 1-1/2 inches in height with the pitch not exceeding 1 in 12 and (2) provides a minimum 32-inch wide clearance into the dwelling.      3</p> <p>(2) Minimum 36-inch wide accessible route from the no-step entrance into at least one visiting room in the dwelling and into at least one full or half bathroom which has a minimum 32-inch clear door width and a 30-inch by 48-inch clear area inside the bathroom outside the door swing.      3</p> <p>(3) Minimum 36-inch wide accessible route from the no-step entrance into at least one bedroom which has a minimum 32-inch clear door width.      3</p> <p>(4) Blocking or equivalent installed in the accessible bathroom walls for future installation of grab bars at water closet and bathing fixture, if applicable.      1</p> <p>(5) All interior and exterior door handles are levers rather than knobs.      1</p> <p>(6) All sink, lavatory and showering controls that comply with ICC A117.1.      1</p> <p>(7) Interior convenience Power receptacles, communication connections (for cable, phone, Ethernet, etc.) and switches are placed between 15" and 48" above the finished floor. Additional switches to control devices and systems (such as alarms, home theaters and other equipment) not required by the local building code may be installed as desired.      1</p> <p>(8) All light switches are rocker-type switches or other similar switches that can be operated by pressing them (with assistive devices). Toggle-type switches may not be used.      1</p> <p>(9) Anyone of the following systems are automated and can be controlled with a wireless device or voice-activated device: HVAC, all permanently-installed lighting, alarm system, window treatments, or door locks.      1 per system [5 max]</p>	<p>12 Max      4</p>	<p><input type="checkbox"/> Steps into main entrance</p> <p><input type="checkbox"/></p> <p><input checked="" type="checkbox"/> Verify will be installing given A6.111 note 2 about providing blocking</p> <p><input checked="" type="checkbox"/> A.711 second general note</p> <p><input checked="" type="checkbox"/> A.C.001</p> <p><input checked="" type="checkbox"/> A.C.002</p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p>
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**11.613 RESILIENT CONSTRUCTION**

11.613.1	<p><b>11.613.1 Intent.</b> Design and construction practices developed by a licensed design professional or equivalent are implemented that enhance the resilience and durability of the structure (above building code minimum design loads) so the structure can better withstand forces generated by; flooding, snow, wind or seismic activity (as applicable) and reduce the potential for the loss of life and property.</p> <p>(a) <b>Minimum structural requirements (base design).</b> The building is designed and constructed in compliance with structural requirements in the IBC or IRC as applicable.      2</p> <p>(b) <b>Enhanced resilience – 10% above base design.</b> Design and construction practices are implemented that enhance the resilience and durability of the structure by designing and building to forces generated by; flooding, snow, wind or seismic (as applicable) that are 10% higher than the base design.      3</p> <p>(c) <b>Enhanced resilience – 20% above base design.</b>      5</p> <p>(d) <b>Enhanced resilience – 30% above base design.</b>      10</p> <p>(e) <b>Enhanced resilience – 40% above base design.</b>      12</p> <p>(f) <b>Enhanced resilience – 50% above base design.</b>      15</p>	<p>0</p>	
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Chapter Level: Silver
Total Project Points: 183
Total Project Level: Silver
Points Needed to Earn Next Chapter Level: 30
Revision Date: 12/11/2024



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Cooling

Practice #	Chapter 7: Energy Efficiency	Points Available	Points Claimed	Status	Notes
<b>11.701 MINIMUM ENERGY EFFICIENCY REQUIREMENTS</b>					
305.2.5	<b>305.2.5 Energy efficiency.</b> The building shall comply with Section 305.2.5.1 or 305.2.5.2. Please indicate energy modeler's professional credential and, in the notes field, their name. When selecting "Other," enter professional credentials (e.g., engineer, architect) within the notes field.	Mandatory		Reduction Path	
		Mandatory		Modeler's Credential:	
				HERS Rater	Tyler Wentland
11.701.4	<b>11.701.4 Mandatory practices.</b>				
11.701.4.0	<b>11.701.4.0 Minimum energy efficiency requirements.</b> Additions, alterations, or renovations to an existing building, building system or portion thereof shall comply with the provisions of the ICC IECC as they relate to new construction without requiring the unaltered portion(s) of the existing building or building system to comply with the ICC IECC. An addition complies with the IECC if the addition complies or if the existing building and addition comply with the ICC IECC as a single building.	Mandatory		<input checked="" type="checkbox"/>	Verify
11.701.4.1	<b>11.701.4.1 HVAC systems.</b>				
11.701.4.1.1	<b>11.701.4.1.1 HVAC system sizing.</b> Newly installed or modified space heating and cooling system is sized according to heating and cooling loads calculated using ACCA Manual J, or equivalent. New equipment is selected using ACCA Manual S or equivalent.	Mandatory		<input checked="" type="checkbox"/>	EDI
11.701.4.1.2	<b>11.701.4.1.2 Radiant and hydronic space heating.</b> Where installed as a primary heat source in the building, new radiant or hydronic space heating system is designed, installed, and documented, using industry-approved guidelines and standards (e.g., ACCA Manual J, AHRI I=B=R, ANSI/ACCA 5 QI-2010, or an accredited design professional's and manufacturer's recommendations).	N/A			
11.701.4.2	<b>11.701.4.2 Duct systems.</b>				
11.701.4.2.1	<b>11.701.4.2.1 Duct air sealing.</b> Newly installed, modified, or ducts that are exposed during the remodel are air sealed. All duct sealing materials are in conformance with UL 181A or UL 181B specifications and are installed in accordance with manufacturer's instructions.	Mandatory		<input checked="" type="checkbox"/>	Verify
11.701.4.2.2	<b>11.701.4.2.2 Ducts and Plenums.</b> Building framing cavities are not used as ducts or plenums. Existing building cavities currently used as supply ducts exposed during the remodel are lined.	Mandatory		<input checked="" type="checkbox"/>	Verify
11.701.4.2.3	<b>11.701.4.2.3 Duct system sizing.</b> New or modified Duct system is sized and designed in accordance with ACCA Manual D or equivalent.	Mandatory		<input checked="" type="checkbox"/>	EDI
11.701.4.3	<b>11.701.4.3 Insulation and air sealing.</b>				
11.701.4.3.1	<b>11.701.4.3.1 Building Thermal Envelope Air Sealing.</b> The building thermal envelope exposed or created during the remodel is durably sealed to limit infiltration. The sealing methods between dissimilar materials allow for differential expansion and contraction. The following are caulked, gasketed, weather-stripped or otherwise sealed with an air barrier material, suitable film, or solid material:  (a) All joints, seams and penetrations. (b) Site-built windows, doors, and skylights. (c) Openings between window and door assemblies and their respective jambs and framing. (d) Utility penetrations. (e) Dropped ceilings or chases adjacent to the thermal envelope. (f) Knee walls. (g) Walls, ceilings, and floors separating conditioned spaces from unconditioned space. (h) Behind tubs and showers on exterior walls. (i) Common walls between dwelling units or sleeping units. (j) Attic access openings. (k) Joints of framing members at rim joists. (l) Top and bottom plates. (m) Other sources of infiltration.	Mandatory		701.4.3.3 Exception: <input type="checkbox"/>	
				Met	Verify
				N/A	
				Met	Verify
				N/A	
				N/A	
				N/A	
				Met	Verify
				Met	Verify
				N/A	
				N/A	
				N/A	
				N/A	
11.701.4.3.2	<b>11.701.4.3.2 Air barrier, air sealing, building envelope testing and insulation.</b> For portions of the building envelope that are exposed or created during the remodel, building envelope air tightness and insulation installation is verified to be in accordance with this Section and Section 11.701.4.3.2.1. Insulation installation other than Grade 1 is not permitted.  (1) <b>Testing.</b> Building envelope tightness is tested. Testing is conducted in accordance with ASTM E-779 using a blower door at a test pressure of 1.04 psf (50 Pa). Testing is conducted after rough-in and after installation of penetrations of the building envelope, including penetrations for utilities, plumbing, electrical, ventilation, and combustion appliances. Testing is conducted under the following conditions:  Testing is required, unless multifamily building is classified as commercial by IECC and building is in compliance with IECC C402.5 (Air Leakage and Thermal Envelope. Commercial buildings have option to comply via testing or per C402.5.  (a) Exterior windows and doors, fireplace and stove doors are closed, but not sealed; (b) Dampers are closed, but not sealed, including exhaust, intake, makeup air, backdraft and flue dampers; (c) Interior doors are open; (d) Exterior openings for continuous ventilation systems and heat recovery ventilators are closed and sealed; (e) Heating and cooling systems are turned off; (f) HVAC duct terminations are not sealed; and (g) Supply and return registers are not sealed.  Multifamily Building Note: Testing by dwelling units, sleeping units, groups of dwelling units, groups of sleeping units, or the building as a whole is acceptable.  (2) <b>Visual inspection.</b> The air barrier and insulation items listed in Table 11.701.4.3.2(2) are field verified by visual inspection.  <a href="#">See Table 11.701.4.3.2(2)</a>	Mandatory		No affected areas: <input type="checkbox"/>	
				ACH50: 0.00	EDI
				ELR:	
11.701.4.3.2.1	<b>11.701.4.3.2.1 Grade 1 insulation installation.</b> Field-installed insulation products to ceilings, walls, floors, band joists, rim joists, conditioned attics, basements, and crawlspaces, except as specifically noted, are verified as Grade 1 by a third-party in accordance with the following:  (1) Inspection is conducted before insulation is covered. (2) Air-permeable insulation is enclosed on all six sides and is in substantial contact with the sheathing material on one or more sides (interior or exterior) of the cavity. Air permeable insulation in ceilings is not required to be enclosed when the insulation is installed in substantial contact with the surfaces it is intended to insulate. (3) Cavity insulation uniformly fills each cavity side-to-side and top-to-bottom, without substantial gaps or voids around obstructions (such as blocking or bridging). (4) Cavity insulation compression or incomplete fill amounts to 2 percent or less, presuming the compressed or incomplete areas are a minimum of 70 percent of the intended fill thickness; occasional small gaps are acceptable. (5) Exterior rigid insulation has substantial contact with the structural framing members or sheathing materials and is tightly fitted at joints. (6) Cavity insulation is split, installed, and/or fitted tightly around wiring and other services. (7) Exterior sheathing is not visible from the interior through gaps in the cavity insulation. (8) Faced batt insulation is permitted to have side-stapled tabs, provided the tabs are stapled neatly with no buckling, and provided the batt is compressed only at the edges of each cavity, to the depth of the tab itself. (9) Where properly installed, ICFs, SIPs, and other wall systems that provide integral insulation are deemed in compliance with this section.	Mandatory		<input checked="" type="checkbox"/>	EDI inspects

11.701.4.3.3	11.701.4.3.3 Multifamily air leakage alternative. Multifamily buildings four or more stories in height and in compliance with IECC section C402.5 (Air leakage-thermal envelope) are deemed to comply with Sections 11.701.4.3.1 and 11.701.4.3.2.		See 11.703.4.3.1	
11.701.4.3.4	11.701.4.3.4 Fenestration air leakage. Newly installed Windows, skylights and sliding glass doors have an air infiltration rate of no more than 0.3 cfm per square foot (1.5 L/s/m <sup>2</sup> ), and swinging doors no more than 0.5 cfm per square foot (2.6 L/s/m <sup>2</sup> ), when tested in accordance with NFRC 400 or AAMA/WDMA/CSA 101/.S.2/A440 by an accredited, independent laboratory and listed and labeled. For site-built fenestration, a test report by an accredited, independent laboratory verifying compliance with the applicable infiltration rate shall be submitted to demonstrate compliance with this practice. This practice does not apply to field-fabricated fenestration products. Exception: For Tropical Zones only, jalousie windows are permitted to be used as a conditioned space boundary and shall have an air infiltration rate of not more than 1.3 cfm per square foot.	Mandatory	Met	Verify window specs
11.701.4.3.5	11.701.4.3.5 Lighting and building thermal envelope. Newly installed luminaires installed in the building thermal envelope which penetrate the air barrier are sealed to limit air leakage between conditioned and unconditioned spaces. All luminaires are IC-rated and labeled as meeting ASTM E283 when tested at 1.57 psf (75 Pa) pressure differential with no more than 2.0 cfm (0.944 L/s) of air movement from the conditioned space to the ceiling cavity. All luminaires installed in the building thermal envelope which penetrate the air barrier are sealed with a gasket or caulk between the housing and the interior of the wall or ceiling covering.	Mandatory	N/A	
11.701.4.4	11.701.4.4 High-efficacy lighting. A minimum of 90 percent of newly installed hard-wired lighting fixtures or the bulbs in those fixtures shall be high efficacy.	Mandatory	Met	Verify LED
11.701.4.5	11.701.4.5 Boiler piping. Boiler piping in unconditioned space supplying and returning heated water or steam that is accessible during the remodel is insulated. Exception: where condensing boilers are installed, insulation is not required for return piping.	N/A		
11.701.4.6	11.701.4.6 Fenestration specifications. The NFRC-certified U-factor and SHGC of newly installed windows, exterior doors, skylights, and tubular daylighting devices (TDDs) do not exceed the values in Table 11.703.2.5.1. <a href="#">See Table 11.703.2.5.1</a>	Mandatory	N/A	
11.701.4.7	11.701.4.7 Replacement fenestration. Where some or all of an existing fenestration unit is replaced with a new fenestration product, including sash and glazing, the NFRC-certified U-factor and SHGC of the replacement fenestration unit do not exceed the values in Table 11.703.2.5.1.	Mandatory	Met	Verify window specs

305.2.5.1	305.2.5.1 Energy consumption reduction path. The energy efficiency rating level shall be based on the reduction in energy consumption resulting from the remodel in accordance with Table 305.2.5.1. <a href="#">See Table 305.2.5.1</a> The reduction in energy consumption resulting from the remodel shall be based on the estimated annual energy cost savings or source energy savings as determined by a third-party energy audit and analysis or utility consumption data. The reduction shall be the percentage difference between the consumption per square foot before and after the remodel calculated as follows:  $\left[ \frac{\text{consumption per square foot before remodel} - \text{consumption per square foot after remodel}}{\text{consumption per square foot before remodel}} \right] * 100$ The occupancy and lifestyle assumed and the method of making the energy consumption estimates shall be the same for estimates before and after the remodel. The building configuration for the after-remodel estimate shall include any additions to the building or other changes to the configuration of the conditioned space. For multifamily buildings, the energy consumption shall be based on the entire building including all dwelling units and common areas. If a building can demonstrate through documentation approved by the Adopting Entity that the remodel activities started prior to project registration, the energy baseline (consumption per square foot before remodel) can be calculated based on data and building systems that was existing in the building up to 3 years prior to project registration.			Minimum required for silver  Energy Reduction: 25.0%
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<b>11.703 PRESCRIPTIVE PATH</b>				
11.703.1	11.703.1 Mandatory practices	30	0	
	11.703.1 is required when thermal envelope and/or duct systems changes are included in the renovation project scope. If not included within scope, select "N/A" and score at least 30 points from other 11.703 practices.			
11.703.1.1	11.703.1.1 Building thermal envelope compliance. The building thermal envelope is in compliance with Section 11.703.1.1.1 or 11.703.1.1.2. Exception: Section 11.703.1.1 is not required for Tropical Climate Zone.	N/A		
11.703.1.1.1	11.703.1.1.1 Maximum UA. For IECC residential, the total building UA is less than or equal to the total maximum UA as computed by 2018 IECC Section R402.1.5. For IECC commercial, the total UA is less than or equal to the sum of the UA for 2018 IECC Tables C402.1.4 and C402.4, including the U-factor times the area and C-factor or F-factor times the perimeter. The total UA proposed and baseline calculations are documented. REScheck or COMcheck is deemed to provide UA calculation documentation.			
11.703.1.1.2	11.703.1.1.2 Prescriptive R-value and fenestration requirements. The building thermal envelope is in accordance with the insulation and fenestration requirements of 2018 IECC R502.1.1.1. The SHGC is in accordance with the 2018 IECC requirements.			
11.703.1.2	11.703.1.2 Building envelope leakage. The building thermal envelope is in accordance with 2018 IECC R502.1.1.1 or R503.1.1 as applicable. Exception: Section 11.703.1.2 is not required for Tropical Climate Zone.	N/A		
11.703.1.3	11.703.1.3 Duct testing. The duct system is in accordance with 2018 IECC R403.3.2 through R403.3.5 as applicable.	N/A		Rough-In Test: Postconstruction Test:

11.703.2	<b>11.703.2 Building envelope</b>				
11.703.2.1	<b>11.703.2.1 UA improvement.</b> The total building thermal envelope UA is less than or equal to the baseline total UA resulting from the U-factors provided in Table 11.703.2.1(a) or ICC IECC Tables C402.1.4 and C402.4, as applicable. Where insulation is used to achieve the UA improvement, the insulation installation is in accordance with Grade 1 meeting Section 701.4.3.2.1 as verified by a third-party. Total UA is documented using a REScheck, COMcheck, or equivalent report to verify the baseline and the UA improvement.  <a href="#">See Table 11.703.2.1(a)</a>	<a href="#">Per Table 11.703.2.1(b)</a>	0	UA Improvement:	
11.703.2.2	<b>11.703.2.2 Mass walls.</b> More than 75 percent of the above-grade exterior opaque wall area of the building is mass walls.	<a href="#">Per Table 11.703.2.2</a>	0	Mass thickness:	
11.703.2.3	<b>11.703.2.3 A radiant barrier</b> with an emittance of 0.05 or less is used in the attic. The product is tested in accordance with ASTM C1371 and installed in accordance with the manufacturer's instructions. <i>[In climate zones 1-3, one point maximum for multifamily buildings four or more stories in height.]</i>	1	0		
11.703.2.4	<b>11.703.2.4 Building envelope leakage.</b> The maximum building envelope leakage rate is in accordance with Table 11.703.2.4 and whole building ventilation is provided in accordance with Section 902.2.1. <i>[Points not awarded if points are taken under Section 11.705.6.2.1]</i>	<a href="#">Per Table 11.703.2.4</a>	0	ACH50 (from 701.4.3.2):	0.00
11.703.2.5	<b>11.703.2.5 Fenestration</b>				
11.703.2.5.1	<b>11.703.2.5.1 NFRC-certified</b> (or equivalent) U-factor and SHGC of windows, exterior doors, skylights, and tubular daylighting devices (TDDs) on an area-weighted average basis do not exceed the values in Table 11.703.2.5.1. Area weighted averages are calculated separately for the categories of 1) windows and exterior doors and 2) skylights and tubular daylighting devices (TDDs). Decorative fenestration elements with a combined total maximum area of 15 square feet (1.39 m <sup>2</sup> ) or 10 percent of the total glazing area, whichever is less, are not required to comply with this practice.	N/A			
11.703.2.5.1.1	<b>11.703.2.5.1.1 Dynamic glazing.</b> Dynamic glazing is permitted to satisfy the SHGC requirements of Table 11.703.2.5.1 provided the ratio of the higher to lower labeled SHGC is greater than or equal to 2.4 and the dynamic glazing is automatically controlled to modulate the amount of solar gain into the space in multiple steps. Fenestration with dynamic glazing is considered separately from other fenestration and area-weighted averaging with fenestration that does not use dynamic glazing is not permitted. Dynamic glazing is not required to be automatically controlled or comply with minimum SHGC ratio when both the lower and higher labeled SHGC already comply with the requirements of Table 11.703.2.5.1.  <a href="#">See Table 11.703.2.5.1</a>				
11.703.2.5.2	<b>11.703.2.5.2</b> The NFRC-certified (or equivalent) U-factor and SHGC of windows, exterior doors, skylights, and tubular daylighting devices (TDDs) are in accordance with Table 11.703.2.5.2(a), (b), or (c). Decorative fenestration elements with a combined total maximum area of 15 square feet (1.39 m <sup>2</sup> ) or 10 percent of the total glazing area, whichever is less, are not required to comply with this practice.  (a) Table 703.2.5.2(a) (b) Table 703.2.5.2(b) (c) Table 703.2.5.2(c)  [Points for multifamily buildings four or more stories in height are awarded at 3 times the point value listed in Table 703.2.5.2(c)]	<a href="#">Per Table 11.703.2.5.2(a)</a> or <a href="#">11.703.2.5.2(b)</a> or <a href="#">11.703.2.5.2(c)</a>	0		
11.703.2.5.2.1	<b>11.703.2.5.2.1 Dynamic glazing.</b> Dynamic glazing is permitted to satisfy the SHGC requirements of Tables 11.703.2.5.2(a), 11.703.2.5.2(b), and 11.703.2.5.2(c) provided the ratio of the higher to lower labeled SHGC is greater than or equal to 2.4, and the dynamic glazing is automatically controlled to modulate the amount of solar gain into the space in multiple steps. Fenestration with dynamic glazing is considered separately from other fenestration, and area-weighted averaging with fenestration that does not use dynamic glazing is not permitted. Dynamic glazing is not required to be automatically controlled or comply with minimum SHGC ratio when both the lower and higher labeled SHGC already comply with the requirements of Tables 11.703.2.5.2(a), 11.703.2.5.2(b), and 11.703.2.5.2(c).				

11.703.3 HVAC equipment efficiency					
11.703.3	<b>11.703.3.0 Multiple heating and cooling systems.</b> For multiple heating or cooling systems in one home, practices 11.703.3.1 through 11.703.3.6 apply to the system that supplies 80% or more of the total installed heating or cooling capacity. Where multiple systems each serve less than 80% of the total installed heating or cooling capacity, points under Sections 11.703.3.1 through 11.703.3.6 are awarded either for the system eligible for the fewest points or the weighted average of the systems. The weighted average shall be calculated in accordance with the following equation and be based upon the efficiency and capacity of the equipment as selected in accordance with ACCA Manual 5 with it loads calculated in accordance with ACCA Manual 1 $\text{Weighted Average} = \frac{([E_{\text{unit } 1} * C_{\text{unit } 1}] + [E_{\text{unit } 2} * C_{\text{unit } 2}] + \dots + [E_{\text{unit } n} * C_{\text{unit } n}])}{(C_{\text{unit } 1} + C_{\text{unit } 2} + \dots + C_{\text{unit } n})}$ where: E = Rated AHRI efficiency for unit C = Rated heating or cooling capacity for unit n = Unit count			multiple heating sys.?	
11.703.3.1	<b>11.703.3.1</b> Combination space heating and water heating system (combo system) is installed using either a coil from the water heater connected to an air handler to provide heat for the building, dwelling unit or sleeping unit, or a space heating boiler using an indirect-fired water heater. Devices have a minimum combined annual efficiency of 0.80 and a minimum water heating recovery efficiency of 0.87.	4	0		
11.703.3.2	<b>11.703.3.2</b> Furnace and/or boiler efficiency is in accordance with one of the following:				
(1)	Gas and propane heaters:		0	Min. or Average AFUE:	
	≥90% AFUE	8			
	≥92% AFUE	10			
	≥94% AFUE	11			
	≥96% AFUE	12			
	≥98% AFUE	13			
(2)	Oil furnace:		0	Min. or Average AFUE:	
	≥85% AFUE	3			
	≥90% AFUE	6			
(3)	Gas boiler:		0	Min. or Average AFUE:	
	≥85% AFUE	3			
	≥90% AFUE	6			
	≥94% AFUE	8			
	≥96% AFUE	9			
(4)	Oil boiler:		0	Min. or Average AFUE:	
	≥85% AFUE	3			
	≥90% AFUE	6			
11.703.3.3	<b>11.703.3.3</b> Heat pump heating efficiency is in accordance with Table 11.703.3.3(1) or Table 11.703.3.3(2) or Table 11.703.3.3(3). Refrigerant charge is verified for compliance with manufacturer's instructions utilizing a method in Section 4.3 of ACCA 5 QI-2010.				
(1)	Electric Heat Pump Heating		0	Min. or Average HSPF:	
	≥8.5 HSPF	11			
	≥9.0 HSPF	11			
	≥9.5 HSPF	11			
	≥10.0 HSPF	11			
	≥12.0 HSPF	11			
(2)	Electric Heat Pump Heating for Multifamily Buildings Four or More Stories in Height	11	0	Min. or Average COP:	
(3)	Gas Engine-Driven Heat Pump Heating (≥1.3 COP at 47°F)	16	0		
11.703.3.4	<b>11.703.3.4</b> Cooling efficiency is in accordance with Table 11.703.3.4(1) or Table 11.703.3.4(2). Refrigerant charge is verified for compliance with manufacturer's instructions utilizing a method in Section 4.3 of ACCA 5 QI-2010.				
(1)	Electric Air Conditioner and Heat Pump Cooling		0	Min. or Average SEER:	
	≥15 SEER	1			
	≥17 SEER	3			
	≥19 SEER	4			
	≥21 SEER	6			
	≥25 SEER	8			
(*)	Tropical Climate Zone: None of the occupied space is air conditioned and ceiling fans are provided for bedrooms and the largest space which is not used as a bedroom.	20	0	Min. or Average COP:	
(2)	Gas Engine-Driven Heat Pump Cooling (≥1.2 COP at 95°F)	1	0		
11.703.3.5	<b>11.703.3.5</b> Water source cooling and heating efficiency is in accordance with Table 11.703.3.5. Refrigerant charge is verified for compliance with manufacturer's instructions utilizing a method in Section 4.3 of ACCA 5 QI-2010.	37	0		
11.703.3.6	<b>11.703.3.6</b> Ground source heat pump is installed by a Certified Geothermal Service Contractor in accordance with Table 11.703.2.5. Refrigerant charge is verified for compliance with manufacturer's instructions utilizing a method in Section 4.3 of ACCA 5 QI-2010.		0	Min. or Average EER:	
	≥16 EER	22			
	≥24 EER	35			
	≥28 EER	44			
11.703.3.7	<b>11.703.3.7</b> ENERGY STAR, or equivalent, ceiling fans are installed. [Points awarded per building.] [For Tropical Climate Zone and Climate Zones 2B, 3B, and 4B: points awarded per fan where AC is not installed in the dwelling unit or sleeping unit (Max 8 points), and where points awarded in Section 11.703.3.8 for these specific climate zones, points shall not be awarded in Section 11.703.3.7]	1	0	# of fans:	
	NOTE: For multi-unit buildings, each dwelling unit must comply to claim this point.				
11.703.3.8	<b>11.703.3.8</b> Whole-building or whole-dwelling unit or whole-sleeping unit fan(s) with insulated louvers and a sealed enclosure is installed. [Points awarded per building.] NOTE: For multi-unit buildings, each dwelling unit must have compliant whole-dwelling unit fans installed to claim these points.	3	0		

11.703.4	<b>11.703.4 Duct systems</b>				
11.703.4.1	11.703.4.1 All space heating is provided by a system(s) that does not include air ducts.	8	0	<input type="checkbox"/>	
11.703.4.2	11.703.4.2 All space cooling is provided by a system(s) that does not include air ducts.	1	0	<input type="checkbox"/>	
11.703.4.3	11.703.4.3 Ductwork is in accordance with all of the following:	8	0	<input type="checkbox"/>	
(1)	Building cavities are not used as return ductwork.			<input type="checkbox"/>	
(2)	Heating and cooling ducts and mechanical equipment are installed within the conditioned building space.			<input type="checkbox"/>	
(3)	Ductwork is not installed in exterior walls.			<input type="checkbox"/>	
11.703.4.4	11.703.4.4 Duct Leakage. The entire central HVAC duct system, including air handlers and register boots, is tested by a third party for total leakage at a pressure differential of 0.1 inches w.g. (25 Pa) and maximum air leakage is equal to or less than 6 percent of the system design flow rate or 4 cubic feet per minute per 100 square feet of conditioned floor area. <i>[Points not awarded if points are taken under Section 11.705.6.2.3]</i>		0	<input type="checkbox"/>	Sys. Design Flow Rate: Building Leakage:
(1)	ductwork entirely outside the building's thermal envelope	2			
(2)	ductwork entirely inside the building's thermal envelope	1			
(3)	ductwork inside and outside the building's thermal envelope	1			
11.703.5	<b>11.703.5 Water heating system</b>				
11.703.5.1	11.703.5.1 Water heater Uniform Energy Factor (UEF) is in accordance with the following: <i>[Where multiple systems are used, points awarded based on the system with the lowest efficiency.]</i> <i>[Water heater design is based on only 1 (one) water heater per dwelling unit, based on approved methods from IPC or ASPE or manufacturer specifications.]</i> <i>[All table values are based on water heaters with medium water draws as defined by the US DOE text procedures (55 gallons per day).]</i>			type: efficiency:	
(1)	Gas water heating				
(a)	Storage Water Heater, Rated Storage Volume > 20 Gallons and ≤ 55 Gallons, Medium Water Draw		0		
	UEF: 0.65 to <0.78	2			
	UEF: ≥0.78	3			
(b)	Storage Water Heater, Rated Storage Volume > 55 Gallons and ≤ 100 Gallons, Medium Water Draw	1	0		
(c)	Storage Water Heater with Input Rate Greater than 75,000 Btu/h (Commercial)		0		
	Thermal Efficiency: 0.90 to < 0.95	3			
	Thermal Efficiency: ≥0.95	4			
(d)	Storage Water Heater with Input Rate Greater than 75,000 Btu/h (Commercial), In Buildings with High-Capacity Service Water-Heating Systems (1,000,000 Btu/h or Greater)		0		
	Thermal Efficiency: 0.92 to < 0.95	1			
	Thermal Efficiency: ≥0.95	2			
(e)	Instantaneous Water Heater, Rated Storage Volume < 2 Gallons and Input Rate of > 50,000 Btu/h, Medium Water Draw		0		
	UEF: 0.89 to < 0.94	1			
	UEF: ≥0.94	2			
(2)	Electric water heating				
(a)	Storage Water Heater, Rated Storage Volume ≥ 20 Gallons and ≤ 55 Gallons, Medium Water Draw		0		
	UEF: 0.94 to <1.0	1			
	UEF: 1.0 to <1.5	1			
	UEF: 1.5 to <2.0	2			
	UEF: 2.0 to <2.2	4			
	UEF: 2.2 to <2.5	5			
	UEF: 2.5 to <3.0	6			
	UEF: ≥3.0	8			
(b)	Storage Water Heater, Rated Storage Volume ≥ 55 Gallons and ≤ 120 Gallons, Medium Water Draw		0		
	UEF: 2.2 to <2.5	2			
	UEF: 2.5 to <3.0	3			
	UEF: 3.0 to <3.5	3			
	UEF: ≥3.5	4			
(c)	Electric Tabletop Water Heating (Tabletop Water Heater, Rated Storage Volume ≥ 20 Gallons and ≤ 120 Gallons, Medium Water Draw)	1	0		
(d)	Electric Instantaneous Water Heating (Instantaneous Electric Water Heater, Rated Storage Volume < 2 Gallons, Medium Water Draw)	2	0		
(e)	Electric Grid Enabled Water Heating (Grid Enabled Storage Water Heater, Rated Storage Volume ≥ 75 Gallons, Medium Water Draw)	1	0		
(3)	Oil water heating	1	0		
11.703.5.2	11.703.5.2 Desuperheater is installed by a qualified installer or is pre-installed in the factory.	23	0	<input type="checkbox"/>	
11.703.5.3	11.703.5.3 Drain-water heat recovery system is installed. <i>[Points awarded per building.]</i>	2	0	<input type="checkbox"/>	
11.703.5.4	11.703.5.4 Indirect-fired water heater storage tanks heated from boiler systems are installed.	1	0	<input type="checkbox"/>	
11.703.5.5	11.703.5.5 Solar water heater. SRCC (Solar Rating & Certification Corporation) OG 300 rated, or equivalent, solar domestic water heating system is installed. Solar Energy Factor (SEF) as defined by SRCC is in accordance with Table 11.703.5.5(a) and Table 11.703.5.5(b).			SEF:	
(a)	Storage Water Heater, Rated Storage Volume of Backup Water Heater is ≥ 0.1 Gallon and ≤ 55 Gallons, Medium Water Draw		0		
	SEF ≥ 1.3	6			
	SEF ≥ 1.51	9			
	SEF ≥ 1.81	13			
	SEF ≥ 2.31	19			
	SEF ≥ 3.01	27			
(b)	Storage Water Heater, Rated Storage Volume of Backup Water Heater is >55 Gallons, Medium Water Draw		0		
	SEF ≥ 1.3	4			
	SEF ≥ 1.51	6			
	SEF ≥ 1.81	8			
	SEF ≥ 2.31	13			
	SEF ≥ 3.01	18			
11.703.6	<b>11.703.6 Lighting and appliances</b>				
11.703.6.1	11.703.6.1 Hard-wired lighting. Hard-wired lighting is in accordance with one of the following:				
(1)	A minimum (95%) percent of the total hard-wired interior luminaires or lamps qualify as ENERGY STAR, DesignLights Consortium (DLC), or applicable equivalent.	2	0	<input type="checkbox"/>	
(2)	A minimum of 80 percent of the exterior lighting wattage has a minimum efficacy of 61 lumens per watt or is solar-powered.	1	0	<input type="checkbox"/>	
(3)	In multifamily buildings, common area lighting power density (LPD) is less than 0.51 Watts per square foot.	7	0	<input type="checkbox"/>	
11.703.6.2	11.703.6.2 Appliances. ENERGY STAR or equivalent appliance(s) are installed:				
(1)	Refrigerator	1	0	<input type="checkbox"/>	
(2)	Dishwasher	1	0	<input type="checkbox"/>	
(3)	Washing machine	4	0	<input type="checkbox"/>	
	<b>Multifamily Building Note: Washing machines in ALL units must comply.</b>				

11.703.7	<b>11.703.7 Passive solar design</b>				
11.703.7.1	<b>11.703.7.1 Sun-tempered design.</b> Building orientation, sizing of glazing, and design of overhangs are in accordance with all of the following:	4	0		
(1)	The long side (or one side if of equal length) of the building faces within 20 degrees of true south.				
(2)	Vertical glazing area is between 5 and 7 percent of the gross conditioned floor area on the south face [also see Section 11.703.7.1(8)] and glazing U-factors meet Table 11.703.2.5.2(a).				
(3)	Vertical glazing area is less than 2 percent of the gross conditioned floor area on the west face, and glazing meets Table 11.703.2.5.2(a).				
(4)	Vertical glazing area is less than 4 percent of the gross conditioned floor area on the east face, and glazing meets Table 11.703.2.5.2(a).				
(5)	Vertical glazing area is less than 8 percent of the gross conditioned floor area on the north face, and glazing meets Table 11.703.2.5.2(a).				
(6)	Skylights, where installed, are in accordance with the following:				
(a)	shades and insulated wells are used, and all glazing meets Table 11.703.2.5.2(a)				
(b)	horizontal skylights are less than 0.5 percent of finished ceiling area				
(c)	sloped skylights on slopes facing within 45 degrees of true south, east, or west are less than 1.5 percent of the finished ceiling area				
(7)	Overhangs or adjustable canopies or awnings or trellises provide shading on south-facing glass for the appropriate climate zone in accordance with Table 11.703.6.1(7):				
(8)	The south face windows have a SHGC of 0.40 or higher.				
(9)	Return air or transfer grilles/ducts are in accordance with Section 11.705.4. <b>Multifamily Building Note:</b> The site is designed such that at least 40 percent of the multifamily dwelling or sleeping units have one south facing wall (within 15 degrees) containing at least 50 percent of glazing for entire unit. Effective shading is required for passive solar control on all south facing glazing. The floor area of at least 15 feet from the south facing perimeter glazing is massive and exposed to capture solar heat during the day and reradiate at night.				
11.703.7.2	<b>11.703.7.2 Window shading.</b> Automated solar protection or dynamic glazing is installed to provide shading for windows.	1	0		
11.703.7.3	<b>11.703.7.3 Passive cooling design.</b> Passive cooling design features are in accordance with three or more of the following:				
	<i>Points for three items:</i>	3			
	<i>Points for one additional item:</i>	1			
(1)	Exterior shading is provided on east and west windows using one or a combination of the following:				
(a)	vine-covered trellises with the vegetation separated a minimum of 1 foot (305 mm) from face of building				
(b)	moveable awnings or louvers				
(c)	covered porches				
(d)	attached or detached conditioned/unconditioned enclosed space that provides full shade of east and west windows (e.g., detached garage, shed, or building)				
(2)	Overhangs are installed to provide shading on south-facing glazing in accordance with Section 11.703.7.1(7). <i>[Points not awarded if points are taken under Section 11.703.7.1.]</i>				
(3)	Windows and/or venting skylights are located to facilitate cross and stack effect ventilation.				
(4)	Solar reflective roof or radiant barrier is installed in climate zones 1, 2, or 3 and roof material achieves a 3-year aged criteria of 0.50.				
(5)	Internal exposed thermal mass is a minimum of three inches (76 mm) in thickness. Thermal mass consists of concrete, brick, and/or tile fully adhered to a masonry base or other masonry material in accordance with one or a combination of the following:				
(a)	A minimum of 1 square foot (0.09 m <sup>2</sup> ) of exposed thermal mass of floor per 3 square feet (2.8 m <sup>2</sup> ) of gross finished floor area.				
(b)	A minimum of 3 square feet (2.8 m <sup>2</sup> ) of exposed thermal mass in interior walls or elements per square foot (0.09 m <sup>2</sup> ) of gross finished floor area.				
(6)	Roofing material is installed with a minimum 0.75 inch (19 mm) continuous air space offset from the roof deck from eave to ridge.				
11.703.7.4	<b>11.703.7.4 Passive solar heating design.</b> In addition to the sun-tempered design features in Section 11.703.7.1, all of the following are implemented: <i>[Points shall not be awarded in the Tropical Climate Zone]</i>	4	0		
(1)	Additional glazing, no greater than 12 percent, is permitted on the south wall. This additional glazing is in accordance with the requirements of Section 11.703.7.1.				
(2)	Additional thermal mass for any room with south-facing glazing of more than 7 percent of the finished floor area is provided in accordance with the following:				
(a)	Thermal mass is solid and a minimum of 3 inches (76 mm) in thickness. Where two thermal mass materials are layered together (e.g., ceramic tile on concrete base) to achieve the appropriate thickness, they are fully adhered to (touching) each other.				
(b)	Thermal mass directly exposed to sunlight is provided in accordance with the following minimum ratios:				
(i)	Above latitude 35 degrees: 5 square feet (0.465 m <sup>2</sup> ) of thermal mass for every 1 square foot (0.0929 m <sup>2</sup> ) of south-facing glazing.				
(ii)	Latitude 30 degrees to 35 degrees: 5.5 square feet (0.51 m <sup>2</sup> ) of thermal mass for every 1 square foot (0.0929 m <sup>2</sup> ) of south-facing glazing.				
(iii)	Latitude 25 degrees to 30 degrees: 6 square feet (0.557 m <sup>2</sup> ) of thermal mass for every 1 square foot (0.0929 m <sup>2</sup> ) of south-facing glazing.				
(c)	Thermal mass not directly exposed to sunlight is permitted to be used to achieve thermal mass requirements of Section 11.703.7.4 (2) based on a ratio of 40 square feet (3.72 m <sup>2</sup> ) of thermal mass for every 1 square foot (0.0929 m <sup>2</sup> ) of south-facing glazing.				
(3)	In addition to return air or transfer grilles/ducts required by Section 11.703.7.1(9), provisions for forced airflow to adjoining areas are implemented as needed.				

**11.705 ADDITIONAL PRACTICES**

**2 Practices from 11.705 required**

11.705.2	<b>11.705.2 Lighting</b>			
11.705.2.1	<b>11.705.2.1 Lighting controls</b> <i>[Percentages for point thresholds are based on lighting not required for means of egress or security lighting as defined by local building codes.]</i>			
11.705.2.1.1	<b>11.705.2.1.1 Interior lighting.</b> In dwelling units or sleeping units, permanently installed interior lighting fixtures are controlled with an occupancy sensor, or dimmer:	0		
(1)	50 percent to less than 75 percent of lighting fixtures.	1		
(2)	A minimum of 75 percent of lighting fixtures.	2		
11.705.2.1.2	<b>11.705.2.1.2 Exterior lighting.</b> Photo or motion sensors are installed on 75 percent of outdoor lighting fixtures to control lighting. <i>[Percentages for point thresholds does not include lighting equipped with photovoltaics.]</i>	1	0	
11.705.2.1.3	<b>11.705.2.1.3 Multifamily common areas</b>			
(1)	In a multifamily building, occupancy sensors, or dimmers are installed in common areas (except corridors and stairwells).	0		
(a)	50 percent to less than 75 percent of lighting fixtures.	1		
(b)	A minimum of 75 percent of lighting fixtures.	2		
(2)	In a multifamily building, occupancy controls are installed to automatically reduce light levels in interior corridors and exit stairwells when the space is unoccupied. Light levels are reduced by:	0		
(a)	50 percent to less than 75 percent or to local minimum requirements	2		
(b)	A minimum of 75 percent	3		
11.705.2.1.4	<b>11.705.2.1.4</b> In a multifamily building, occupancy controls are installed to automatically reduce light levels in garages and parking structures when the space is unoccupied. Light levels are reduced by:	0		
(1)	50 percent to less than 75 percent or to local minimum requirements	2		
(2)	A minimum of 75 percent	3		
11.705.2.2	<b>11.705.2.2 TDDs and skylights.</b> A tubular daylighting device (TDD) or a skylight that meets the requirements of Table 703.2.5.2(a) is installed in rooms without windows. <i>[Points awarded per building.]</i>	2	0	
11.705.2.3	<b>11.705.2.3 Lighting outlets.</b> Occupancy sensors are installed for a minimum of 80 percent of hard-wired lighting outlets in the interior living space.	1	0	
11.705.2.4	<b>11.705.2.4 Recessed luminaires.</b> The number of recessed luminaires that penetrates the thermal envelope is less than 1 per 400 square feet (37.16 m <sup>2</sup> ) of total conditioned floor area and they are in accordance with Section 11.701.4.3.5.	1	0	# of luminaires: per 73225 square feet
11.705.3	<b>11.705.3 Induction cooktop.</b> Induction cooktop is installed.	1	0	
11.705.4	<b>11.705.4 Return ducts and transfer grilles.</b> Return ducts or transfer grilles are installed in every room with a door. Return ducts or transfer grilles are not required for bathrooms, kitchens, closets, pantries, and laundry rooms.	2	0	
11.705.5	<b>11.705.5 HVAC design and installation</b>			
11.705.5.1	<b>11.705.5.1</b> Meet one or both of the following:			
(1)	HVAC contractor is certified by the Air Conditioning Contractors of Americas Quality Assured Program (ACCA/QA) or by an EPA-recognized HVAC Quality Installation Training Oversight Organization (H-QUITO) or equivalent.	1	0	
(2)	HVAC installation technician(s) is certified by North American Technician Excellence, Inc. (NATE) or equivalent.	1	0	
11.705.5.2	<b>11.705.5.2</b> Performance of the heating and/or cooling system is verified by the HVAC contractor in accordance with all of the following:	3	0	
(1)	Start-up procedure is performed in accordance with the manufacturer's instructions.			
(2)	Refrigerant charge is verified by super-heat and/or sub-cooling method.			
(3)	Burner is set to fire at input level listed on nameplate.			
(4)	Air handler setting/fan speed is set in accordance with manufacturer's instructions.			
(5)	Total airflow is within 10 percent of design flow.			
(6)	Total external system static does not exceed equipment capability at rated airflow.			
11.705.5.3	<b>11.705.5.3</b> HVAC Design is verified by 3rd party as follows:			
(1)	The ENERGY STAR HVAC Design and Rater Design Review Checklists are completed and correct.	3	0	
(2)	HVAC installation is inspected and conforms to HVAC design documents and plans.	3	0	

11.705.6	<b>11.705.6 Installation and performance verification</b>					
11.705.6.1	<b>11.705.6.1</b> Third-party on-site inspection is conducted to verify compliance with all of the following, as applicable. Minimum of two inspections are performed: one inspection after insulation is installed and prior to covering, and another inspection upon completion of the building. Where multiple buildings or dwelling units of the same model or sleeping units of the same model are built by the same builder, a representative sample inspection of a minimum of 15 percent of the buildings or dwelling units or sleeping units is permitted.	3	0		By using this tool, this project automatically qualifies for this practice.	
	(1) Ducts are installed in accordance with the ICC IRC or IMC and ducts are sealed.					
	(2) Building envelope air sealing is installed.					
	(3) Insulation is installed in accordance with Section 11.701.4.3.2.1.					
	(4) Windows, skylights, and doors are flashed, caulked, and sealed in accordance with manufacturer's instructions and in accordance with Section 11.701.4.3.					
11.705.6.2	<b>11.705.6.2 Testing.</b> Testing is conducted to verify performance.					
11.705.6.2.1	<b>11.705.6.2.1 Air leakage validation of building or dwelling units or sleeping units.</b> A visual inspection is performed as described in 11.701.4.3.2(2) and air leakage testing is performed in accordance with ASTM E779, ASTM E1827, or ANSI 380. [Points awarded only for buildings where building envelope leakage testing is not required by ICC IECC.] [Points not awarded if points are taken under Section 11.703.2.4]					
	(1) A blower door test.	3	0		ACH50: ELR:	
	(2) Third-party verification is completed. NOTE: Specify name of person or company conducting blower door test in the assigned Notes area.	5	0			
11.705.6.2.2	<b>11.705.6.2.2 HVAC airflow testing.</b> Balanced HVAC airflows are demonstrated by flow hood or other acceptable flow measurement tool by a third party. Test results are in accordance with the following:					
	(1) Measured flow at each supply and return register meets or exceeds the requirements in ACCA 5 QI-2010, Section 5.2.	5	0			
	(2) Total airflow meets or exceeds the requirements in ACCA 5 QI-2010, Section 5.2. NOTE: Specify name of person or company conducting HVAC airflow test in the assigned Notes area.	3	0			
11.705.6.2.3	<b>11.705.6.2.3 HVAC duct leakage testing.</b> One of the following is achieved: [Points awarded only for buildings where duct leakage testing is not required by IECC.] [Points not awarded if points are taken under Section 11.703.4.4]					
	(1) Duct leakage is in accordance with IECC R403.3.3 and R403.3.4.	3	0			
	(2) Duct leakage is in accordance with IECC R403.3.3 and R403.3.4, and testing is conducted by an independent third party.	5	0			
11.705.6.3	<b>11.705.6.3 Insulating hot water pipes.</b> Insulation with a minimum thermal resistance (R-value) of at least R-3 is applied to the following, as applicable: [Points awarded only where these practices are not required by IECC.]	1	0		required by IECC:	
	(a) piping 3/4-inch and larger in outside diameter					
	(b) piping serving more than one dwelling unit or sleeping unit					
	(c) piping located outside the conditioned space					
	(d) piping from the water heater to a distribution manifold					
	(e) piping located under a floor slab					
	(f) buried piping					
	(g) supply and return piping in recirculation systems other than demand recirculation systems					
11.705.6.4	<b>11.705.6.4 Potable hot water demand re-circulation system.</b>					
11.705.6.4.1	<b>11.705.6.4.1</b> Potable hot water demand re-circulation system is installed in a single-family unit.	1	0			
11.705.6.4.2	<b>11.705.6.4.2</b> Potable hot water demand re-circulation system(s) that serves every unit in a multifamily building is installed in place of a standard circulation pump and control.	2	0			
11.705.7	<b>11.705.7 Submetering system.</b> In multifamily buildings, an advanced electric and fossil fuel submetering system is installed to monitor electricity and fossil fuel consumption for each unit. The device provides consumption information on a monthly or near real-time basis. The information is available to the occupants at a minimum on a monthly basis.	1	0			
<b>11.706 INNOVATIVE PRACTICES</b>						
11.706.1	<b>11.706.1 Energy consumption control.</b> A whole-building or whole-dwelling unit or whole-sleeping unit device or system is installed that controls or monitors energy consumption.	3 Max	0			
	(1) programmable communicating thermostat with the capability to be controlled remotely	1				
	(2) energy-monitoring device or system	1				
	(3) energy management control system	3				
	(4) programmable thermostat with control capability based on occupant presence or usage pattern	1				
	(5) lighting control system	1				
11.706.2	<b>11.706.2 Renewable energy service plan.</b> Renewable energy service plan is provided as follows:					
	(1) Builder selects a renewable energy service plan provided by the local electrical utility for interim (temporary) electric service, or purchases renewable energy certificates (RECs) to cover electricity used. The builder's local administrative office has renewable energy service or has otherwise been paired with RECs. Green-certified (or equivalent) is required for renewable electricity purchases.	1	0			
	(2) The buyer of the building selects one of the following renewable energy service plans provided by the utility prior to occupancy of the building with a minimum two-year commitment.		0			
	(a) less than half of the dwelling's projected electricity and gas use is provided by renewable energy	1				
	(b) half or more of the of the dwelling's projected electricity and gas use is provided by renewable energy	2				
11.706.3	<b>11.706.3 Smart appliances and systems.</b> Smart appliances and systems are installed as follows:		0			
	Three to five smart appliances installed	1				
	Six or more smart appliances installed	2				
	(1) Refrigerator					
	(2) Freezer					
	(3) Dishwasher					
	(4) Clothes Dryer					
	(5) Clothes Washer					
	(6) Room Air Conditioner					
	(7) HVAC Systems					
	(8) Service Hot Water Heating Systems [Items (7) and (8) are permitted to count as two appliances each for the purpose of awarding points.] [where points awarded in Section 11.706.3, points shall not be awarded in Section 11.706.7 and 11.706.10]					
11.706.4	<b>11.706.4 Pumps</b>					
11.706.4.1	<b>11.706.4.1</b> Pool, spa, and water features equipped with filtration pumps as follows:					
	(1) Electronically controlled variable-speed pump(s) is installed (full load efficiency of 90 percent or greater).	1	0			
	(2) Electronically controlled variable-speed pump(s) is installed (full load efficiency of 90 percent or greater) in a pool	3	0			
11.706.4.2	<b>11.706.4.2</b> Sump pump(s) with electrically commutated motors (ECMs) or permanent split capacitor (PSC) motors is installed (full load efficiency of 90 percent or greater).	1	0			

11.706.5	<b>11.706.5 On-site renewable energy system.</b> One of the following options is implemented				
(1)	Building is Solar-Ready in compliance with IECC Appendix A Solar Ready Provisions.	1	0	<input type="checkbox"/>	kW per 84 units:
(2)	An on-site renewable energy system(s) is installed on the property.	2 per kW	0	<input type="checkbox"/>	kWh of strg. per 84 units:
(3)	An on-site renewable energy system(s) and a battery energy storage system are installed on the property. <i>Points shall not be awarded in this section for solar thermal or geothermal systems that provide space heating, space cooling, or water heating, points for these systems are awarded in § 11.703. Points awarded in this section shall not be combined with points for renewable energy in another section of this chapter. The solar-ready zone roof area in #1 is area per dwelling unit. Points in item #2 and #3 shall be divided by the number of dwelling units.</i>	2 per kW, 1 per 2 kWh	0	<input type="checkbox"/>	
	<b>Multifamily Building Note:</b> Conditioned common area and non-residential space is excluded for the purpose of calculating number of units.				
11.706.6	<b>11.706.6 Parking garage efficiency.</b> Structured parking garages are designed to require no mechanical ventilation for fresh air requirements.	2	0	<input type="checkbox"/>	
11.706.7	<b>11.706.7 Grid-interactive electric thermal storage system.</b> A grid-interactive electric thermal storage system is installed. <i>[where points awarded in Section 11.706.7, points shall not be awarded in Section 11.706.3 and 11.706.10]</i>				
(1)	Grid-interactive Water Heating System	1	0	<input type="checkbox"/>	
(2)	Grid-interactive Space Heating and cooling System	1	0	<input type="checkbox"/>	
11.706.8	<b>11.706.8 Electrical vehicle charging station.</b> A Level 2 (208/240V 40-80 amp) or Level 3 electric vehicle charging station is installed on the building site. (Note: Charging station shall not be included in the building energy consumption.)	2	0	<input type="checkbox"/>	
11.706.9	<b>11.706.9 CNG vehicle fueling station.</b> A CNG vehicle residential fueling appliance is installed on the building site. The CNG fueling appliances shall be listed in accordance with ANSI/CSA NGV 5.1 and installed in accordance to the appliance manufacturer's installation instructions. (Note: The fueling appliance shall not be included in the building energy consumption.)	1	0	<input type="checkbox"/>	
11.706.10	<b>11.706.10 Automatic demand response.</b> Automatic demand response system is installed that curtails energy usage upon a signal from the utility or an energy service provider is installed. <i>[where points awarded in Section 11.706.10, points shall not be awarded in Section 11.706.3 and 11.706.7]</i>	1	0	<input type="checkbox"/>	
11.706.11	<b>11.706.11 Grid-interactive battery storage system.</b> A grid-interactive battery storage system of not less than 6 kWh of available capacity is installed.	2	0	<input type="checkbox"/>	
11.706.12	<b>11.706.12 Smart ventilation.</b> A whole-building ventilation systems is installed with automatic ventilation controls to limit ventilation during periods of extreme temperature, extreme humidity, and/or during times of peak utility loads and is in accordance with the specifications of ASHRAE Standard 62.2-2010 Section 4.	1	0	<input type="checkbox"/>	
11.706.13	<b>11.706.13 Alternative refrigerant.</b> Use of the following in mechanical space cooling systems for dwellings.		0	<input type="checkbox"/>	
(1)	Use alternative refrigerant with a GWP < 1000	1		<input type="checkbox"/>	
(2)	Do not use refrigerants	2		<input type="checkbox"/>	
11.706.14	<b>11.706.14 Third-party utility benchmarking service.</b>				
(1)	For a multifamily building, the owner has contracted with a third-party utility benchmarking service with at least five (5) years of experience in utility data management and analysis to perform a monthly analysis of whole-building energy and water consumption for a minimum of 1 year.	3	0	<input type="checkbox"/>	
(2)	The building owner commits to reporting energy data using U.S. Environmental Protection Agency's ENERGY STAR Portfolio Manager for a minimum of three years.	1	0	<input type="checkbox"/>	
11.706.15	<b>11.706.15 Entryway air seal.</b> For multifamily buildings, where not required by the building or energy code, to slow the movement of unconditioned air from outdoors to indoors at the main building entrance, the following is installed:				
(1)	Building entry vestibule.	2	0	<input type="checkbox"/>	
(2)	Revolving entrance doors.	2	0	<input type="checkbox"/>	
<b>END OF CHAPTER 7</b>					<a href="#">CLICK TO PROCEED TO CHAPTER 8 &gt;&gt;</a>

<b>Chapter Level: Gold</b>
<b>Total Project Points: 183</b>
<b>Total Project Level: Silver</b>
<b>Points Needed to Earn Next Chapter Level: 19</b>
Revision Date: 12/11/2024



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Cooling

Practice #	Chapter 8: Water Efficiency	Points Available	Points Claimed	Status	Notes
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**11.801 INDOOR AND OUTDOOR WATER USE**

**11.801.0** **11.801.0 Intent.** Implement measures that reduce indoor and outdoor water usage. Implement measures that include collection and use of alternative sources of water. Implement measures that treat water on site.

**11.801.1** **11.801.1 Mandatory requirements.** The building shall comply with Section 11.802 (Prescriptive Path) and 11.803 (Innovative Practices) or Section 305.2.6.1 (Performance Path). Points from Section 305.2.6.1 (Performance Path) shall not be combined with points from Section 11.802 (Prescriptive Path) or Section 11.803 (Innovative Practices). The mandatory provisions of Section 11.802 (Prescriptive Path) are required when using Section 305.2.6.1 (Performance Path) for Chapter 11.8 Water Efficiency compliance.

**305.2.6.1** **305.2.6.1 Water consumption reduction path.** The water efficiency rating level shall be based on the reduction in water consumption resulting from the remodel in accordance with Table 305.2.6.1.

[See Table 305.2.6.1](#)

Water consumption shall be based on the estimated annual use as determined by a third-party audit and analysis or use of utility consumption data. The reduction shall be the percentage difference between the consumption before and after the remodel calculated as follows:

$$[(\text{consumption before remodel} - \text{consumption after remodel}) / \text{consumption before remodel}] * 100\%$$

The occupancy and lifestyle assumed and the method of making the water consumption estimates shall be the same for estimates before and after the remodel. The building configuration for the after-remodel estimate shall include any changes to the configuration of the building such as additions or new points of water use. For multifamily buildings, the water consumption shall be based on the entire building including all dwelling units and common areas.

Where a building can demonstrate through documentation approved by the Adopting Entity that the remodel activities started prior to project registration, the water baseline (consumption before remodel) shall be calculated based on data and building systems that existed in the building up to 3 years prior to project registration.

Water Reduction:

**11.802 PRESCRIPTIVE PATH**

**11.802.1** **11.802.1 Indoor hot water usage.** Indoor hot water supply system is in accordance with one of the practices listed in items (1) through (5). The maximum water volume from the source of hot water to the termination of the fixture supply is determined in accordance with Tables 11.802.1(1) or 11.802.1(2). The maximum pipe length from the source of hot water to the termination of the fixture supply is 50 feet.

*[Where more than one water heater is used or where more than one type of hot water supply system, including multiple circulation loops, is used, points are awarded only for the system that qualifies for the minimum number of points.]*

*[Systems with circulation loops are eligible for points only if pumps are demand controlled. Circulation systems with timers or aquastats and constant-on circulation systems are not eligible to receive points.]*

*[Points awarded only if the pipes are insulated in accordance with Section 11.705.6.3.]*

(1)	The maximum volume from the water heater to the termination of the fixture supply at furthest fixture is 128 ounces (1 gallon or 3.78 liters).	8			
(2)	The maximum volume from the water heater to the termination of the fixture supply at furthest fixture is 64 ounces (0.5 gallon or 1.89 liters).	12			
(3)	The maximum volume from the water heater to the termination of the fixture supply at furthest fixture is 32 ounces (0.25 gallon or 0.945 liters).	20			
(4)	A demand controlled hot water priming pump is installed on the main supply pipe of the circulation loop and the maximum volume from this supply pipe to the furthest fixture is 24 ounces (0.19 gallons or 0.71 liters).	24			
(a)	The volume in the circulation loop (supply) from the water heater or boiler to the branch for the furthest fixture is no more than 128 ounces (1 gallon or 3.78 liters).	4 Additional			
(5)	A central hot water recirculation system is implemented in multifamily buildings in which the hot water line distance from the recirculating loop to the engineered parallel piping system (i.e., manifold system) is less than 30 feet (9,144 mm) and the parallel piping to the fixture fittings contains a maximum of 64 ounces (1.89 liters) (115.50 cubic inches) (0.50 gallons).	9			
(6)	Tankless water heater(s) with at least 0.5 gallon (1.89 liters) of storage are installed, or a tankless water heater that ramps up to at least 110F within 5 seconds is installed. The storage may be internal or external to the tankless water heater.	4 Additional	0		

**11.802.2** **11.802.2 Water-conserving appliances.** Energy Star or equivalent water-conserving appliances are installed.

(1)	dishwasher	2	2	<input checked="" type="checkbox"/>	A.511 note 11c dishwasher
(2)	clothes washer, or	13	0		
(3)	clothes washer with an Integrated Water Factor of 3.8 or less	18	0		

**[Multifamily Building Note: Washing machines are installed in individual units or provided in common areas of multifamily buildings.]**

**11.802.3** **11.802.3 Water usage metering.** Water meters are installed meeting the following:

(1)	Single-Family Buildings: Water Usage Metering:				
(a)	Where not otherwise required by the local AHJ, installation of a meter for water consumed from any source associated with the building or building site.	2 per unique meter	0		
(b)	Each water meter shall be capable of communicating water consumption data remotely for the dwelling unit occupant and be capable of providing daily data with electronic data storage and reporting capability that can produce reports for daily, monthly, and yearly water consumption. (Fire sprinkler systems are not required to be metered).	2 per sensor package	0		
(2)	Multi-Family Buildings: Water Usage Metering:				
	<i>[Points earned in Section 11.802.3(2) shall not exceed 50% of the total points earned for the Indoor and Outdoor Water Use Category]</i>				
(a)	Where not otherwise required by the local AHJ, installation of a meter for water consumed from any source associated with the building or building site.	2 per unique use meter	0		
(b)	Each water meter shall be capable of communicating water consumption data remotely for the dwelling unit occupant and be capable of providing daily data with electronic data storage and reporting capability that can produce reports for daily, monthly, and yearly water consumption. (Fire sprinkler systems are not required to be metered).	2 per sensor package	0		

11.802.4		11.802.4 Showerheads. Showerheads are in accordance with the following:		# of compartments:	
(1)	The total maximum combined flow rate of all showerheads in a shower compartment with floor area of 2600 square inches or less is equal or less than 2.0 gpm. For each additional 1300 square inches or any portion thereof of shower compartment floor area, an additional 2.0 gpm combined showerhead flow rate is allowed. Showerheads shall comply with ASME A112.18.1/CSA B125.1 and shall meet the performance criteria of the U.S. EPA WaterSense Specification for showerheads. Showerheads shall be served by an automatic compensating valve that complies with ASSE 1016/ASME A112.1016/CSA B125.16 or ASME A112.18.1/CSA B125.1 and specifically designed to provide thermal shock and scald protection at the flow rate of the showerhead. <i>[Points awarded per shower compartment. In multifamily buildings, the average of the points assigned to individual dwelling units or sleeping units may be used as the number of points awarded for this practice, rounded to the nearest whole number.]</i>	4 for first compartment 1 for each additional compartment in dwelling 7 Max	4	1 compartment	Verify
(2)	All shower compartments in the dwelling unit(s) or sleeping unit(s) and common areas meet the requirements of 11.802.4(1) and all showerheads are in accordance with one of the following:  (a) maximum of 1.8 gpm (b) maximum of 1.5 gpm	6 Additional 10 Additional	10	(b)	Verify
(3)	Any shower control that can shut off water flow without affecting temperature is installed. <i>[Points awarded per shower control.]</i> For SI: 1 gallon per minute = 3.785 L/m	1 3 Max	0		
11.802.5		11.802.5 Faucets			
11.802.5.1		11.802.5.1 Install water-efficient lavatory faucets with flow rates not more than 1.5 gpm (5.7 L/min), tested in compliance with ASME A112.18.1/CSA B125.1 and meeting the performance criteria of the EPA WaterSense High-Efficiency Lavatory Faucet Specification:		1 fixture (5)	Verify
(1)	Flow rate ≤ 1.5 gpm <i>[all faucets in a bathroom are in compliance]</i> <i>[Points awarded for each bathroom. In multifamily buildings, the average of the points assigned to individual dwelling units or sleeping units may be used as the number of points awarded for this practice, rounded to the nearest whole number.]</i>	1 [3 max*]	13		
(2)	Flow rate ≤ 1.20 gpm <i>[all faucets in a bathroom are in compliance]</i>	2 [6 max*]			
(3)	Flow rate ≤ 1.5 gpm for all lavatory faucets in the dwelling unit(s) or sleeping unit(s)	6 Additional			
(4)	Flow rate ≤ 1.5 gpm for all lavatory faucets in the dwelling unit(s), and at least one bathroom has faucets with flow rates ≤ 1.20 gpm	8 Additional			
(5)	Flow rate ≤ 1.20 gpm for all lavatory faucets in the dwelling unit(s)	12 Additional			
11.802.5.2		11.802.5.2 Water-efficient residential kitchen faucets are installed in accordance with ASME A112.18.1/CSA B125.1. Residential kitchen faucets may temporarily increase the flow above the maximum rate but not to exceed 2.2 gpm.	4	(2)	Verify
(1)	All residential kitchen faucets have a maximum flow rate of 1.8 gpm.	3			
(2)	All residential kitchen faucets have a maximum flow rate of 1.5 gpm.	1 Additional			
11.802.5.3		11.802.5.3 Self-closing valve, motion sensor, metering, or pedal-activated faucet is installed to enable intermittent on/off operation. <i>[Points awarded per fixture.]</i>	1 3 Max	0	
11.802.5.4		11.802.5.4 Water closets and urinals. Water closets and urinals are in accordance with the following:			
(1)	Gold and emerald levels: All water closets and urinals are in accordance with Section 11.802.5.4.	Met			
(2)	A water closet is installed with an effective flush volume of 1.28 gallons (4.85 L) or less in accordance with ASME A112.19.2/CSA B45.1 or ASME A112.19.14 as applicable. Tank-type water closets shall be in accordance with the performance criteria of the U.S. EPA WaterSense Specification for Tank-Type Toilets <i>[Points awarded per fixture. In multifamily buildings, the average of the points assigned to individual dwelling units or sleeping units may be used as the number of points awarded for this practice, rounded to the nearest whole number.]</i>	4 12 Max	4	1 fixture	Verify
(3)	All water closets are in accordance with Section 11.802.5(2).	13 Additional	13	<input checked="" type="checkbox"/>	Verify
(4)	All water closets are in accordance with Section 11.802.5(2) and one or more of the following are installed:  (a) Water closets that have an effective flush volume of 1.2 gallons or less. <i>[Points awarded per toilet. In multifamily buildings, the average of the points assigned to individual dwelling units or sleeping units may be used as the number of points awarded for this practice, rounded to the nearest whole number.]</i>  (b) One or more urinals with a flush volume of 0.5 gallons (1.9L) or less when tested in accordance with ASME A112.19.2/CSA B45.1.  (c) One or more composting or waterless toilets and/or nonwater urinals. Nonwater urinals shall be tested in accordance with ASME A112.19.2/CSA B45.1.	2 Additional 6 Max 2 Additional 12 Additional	0 0 0	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
11.802.6		11.802.6 Irrigation systems			
11.802.6.1		11.802.6.1 Where an irrigation system is installed, an irrigation plan and implementation are executed by a qualified professional or equivalent.	N/A		
11.802.6.2		11.802.6.2 Irrigation sprinkler nozzles shall be tested according to ANSI standard ASABE/ICC 802-2014 Landscape Irrigation Sprinkler and Emitter Standard by an accredited third party laboratory.	6	0	<input type="checkbox"/>
11.802.6.3		11.802.6.3 Drip irrigation is installed.			
(1)	Drip irrigation is installed for all landscape beds.	4	0	<input type="checkbox"/>	
(2)	Subsurface drip is installed for all turf grass areas.	4	0	<input type="checkbox"/>	
(3)	Drip irrigation zones specifications show plant type by name and water use/need for each emitter <i>[Points awarded only if specifications are implemented.]</i>	5	0	<input type="checkbox"/>	
11.802.6.4		11.802.6.4 The irrigation system(s) is controlled by a smart controller or no irrigation is installed. <i>[Points are not additive.]</i>			
(1)	Irrigation controllers shall be in accordance with the performance criteria of the EPA WaterSense program	10	0	<input type="checkbox"/>	
(2)	No irrigation is installed and a landscape plan is developed in accordance with Section 11.503.5, as applicable.	15	15	<input checked="" type="checkbox"/>	Verify
11.802.6.5		11.802.6.5 Commissioning and water use reduction for irrigation systems. <i>[Points are not additive per each section.]</i>			
(1)	All irrigation zones utilize pressure regulation so emission devices (sprinklers and drip emitters) operate at manufacturer's recommended operating pressure.	3	0	<input type="checkbox"/>	
(2)	Where dripline tubing is installed, a filter with mesh size in accordance with the manufacturer's recommendation is installed on all drip zones.	3	0	<input type="checkbox"/>	
(3)	Utilize spray bodies that incorporate an in-stem or external flow shut-off device.	3	0	<input type="checkbox"/>	
(4)	For irrigation systems installed on sloped sites, either an in-stem or external check valve is utilized for each spray body.	3	0	<input type="checkbox"/>	
(5)	Where an irrigation system is installed, a flow sensing device is installed to monitor and alert the controller when flows are outside design range.	3	0	<input type="checkbox"/>	

11.802.7	<b>11.802.7 Rainwater collection and distribution.</b> Rainwater collection and distribution is provided.					
11.802.7.1	<b>11.802.7.1</b> Rainwater is used for irrigation in accordance with one of the following:		0			
(1)	Rainwater is diverted for landscape irrigation without impermeable water storage	5				
(2)	Rainwater is diverted for landscape irrigation with impermeable water storage in accordance with one of the following:					
(a)	50 – 499 gallon storage capacity	5				
(b)	500 – 2499 gallon storage capacity	10				
(c)	2500 gallon or larger storage capacity (system is designed by a professional certified by The American Rainwater Catchment Systems Association or equivalent)	15				
(d)	All irrigation demands are met by rainwater capture (documentation demonstrating the water needs of the landscape is provided and the system is designed by a professional certified by The American Rainwater Catchment Systems Association or equivalent).	25				
11.802.7.2	<b>11.802.7.2</b> Rainwater is used for indoor domestic demand as follows. The system is designed by a professional certified by The American Rainwater Catchment Systems Association or equivalent.		0			
(1)	Rainwater is used to supply an indoor appliance or fixture for any locally approved use. <i>[Points awarded per appliance or fixture.]</i>	5 15 Max				
(2)	Rainwater provides for total domestic demand. Where rainwater is used as potable water the potable rainwater system shall meet the requirements of IRC Sections P2906 and Section P2912. The following shall also apply:	25				
(a)	The following roof materials shall not be used to collect rainwater: shingles with fire retardant, copper, and materials that contain asbestos. Materials that contain lead, including but not limited to flashings and roof jacks, shall be prohibited.					
(b)	Potable water supplies shall be protected against cross connection with rainwater as specified in IRC Section P2902.1.					
(c)	Disinfection shall be provided by at least one of the following:					
(i)	Ultraviolet (UV) light providing at least 40 mJ/cm <sup>2</sup> at 254 nm for the highest water flow rate. A UV sensor with visible alarm, audible alarm, or water shutoff shall be triggered when the UV light is below the minimum at the sensor. In addition filtration no greater than 5 µm shall be located upstream of the UV light or					
(ii)	filtration no greater than 0.2 µm, or					
(iii)	other approved disinfection					
(d)	Materials and systems that collect, convey, pump, or store rainwater for potable rainwater systems shall comply with NSF 53, NSF 61 or equivalent.					
(e)	The quality of the water at the point of use shall be verified in accordance with the requirements of the jurisdiction.					
(f)	The rainwater storage shall not admit sunlight.					
(g)	Potable rainwater pipe shall not be required to be purple after the point that the water is disinfected.					
11.802.8	<b>11.802.8 Sediment filters.</b> Water filter is installed to reduce sediment and protect plumbing fixtures for the whole building or the entire dwelling unit or the sleeping unit.	1	0			
11.802.9	<b>11.802.9 Water treatment devices.</b>					
11.802.9.1	<b>11.802.9.1</b> Water Softeners shall not be installed where the supplied water hardness is less than 8.0 grains per gallon measured as total calcium carbonate equivalents. Water softeners shall be listed to NSF 44 and a rated salt efficiency of 3400 grains of total hardness per 1.0 pound of salt based on sodium chloride equivalency. Devices shall not discharge more than 4.0 gallons of water per 1000 grains of hardness removed during the service or recharge cycle.		5	(1)	Verify	
(1)	No water softener.	5				
(2)	Water softener installed to supply softened water only to domestic water heater.	2				
11.802.9.2	<b>11.802.9.2</b> Reverse Osmosis (R/O) water treatment systems shall be listed to NSF 58 and shall include automatic shut-off valve to prevent water discharge when storage tank is full.		3	(1)	Verify	
(1)	No R/O system.	3				
(2)	Combined capacity of all R/O systems does not exceed 0.75 gallons.	1				
11.802.10	<b>11.802.10 Pools and spas.</b>					
11.802.10.1	<b>11.802.10.1</b> Pools and Spas with water surface area greater than 36 square feet and connected to a water supply shall have a dedicated meter to measure the amount of water supplied to the pool or spa.	Mandatory		N/A	None	
(1)	Automated motorized non-permeable pool cover that covers the entire pool surface.	10	0			
<b>11.803 INNOVATIVE PRACTICES</b>						
11.803.1	<b>11.803.1 Reclaimed, gray, or recycled water.</b> Reclaimed, gray, or recycled water is used as permitted by applicable code. <i>[Points awarded for either Section 11.803.1(1) or 11.803.1(2), not both.]</i> <i>[Points awarded for either Section 11.803.6 or 11.803.1, not both.]</i>		0			
(1)	each water closet flushed by reclaimed, gray, or recycled water <i>[Points awarded per fixture or appliance.]</i>	5 20 Max				
(2)	irrigation from reclaimed, gray, or recycled water on-site	10				
11.803.2	<b>11.803.2 Reclaimed water, greywater, or rainwater pre-piping.</b> Reclaimed, graywater, or rainwater systems are rough plumbed (and permanently marked, tagged or labeled) into buildings for future use.	3 per roughed in system	0		# of systems:	
11.803.3	<b>11.803.3 Automatic leak detection and control devices.</b> One of the following devices is installed. Where a fire sprinkler system is present, the device will be installed to not interfere with the operation of the fire sprinkler system.	2	0			
(1)	automatic water leak detection and control devices					
(2)	automatic water leak detection and shutoff devices					
11.803.4	<b>11.803.4 Engineered biological system or intensive bioremediation system.</b> An engineered biological system or intensive bioremediation system is installed and the treated water is used on site. Design and implementation are approved by appropriate regional authority.	20	0			
11.803.5	<b>11.803.5 Recirculating humidifier.</b> Where a humidifier is required, a recirculating humidifier is used in lieu of a traditional "flow through" type.	1	0			
11.803.6	<b>11.803.6 Advanced wastewater treatment system.</b> Advanced wastewater (aerobic) treatment system is installed and treated water is used on site. <i>[Points awarded for either Section 11.803.6 or 11.803.1, not both.]</i>	20	0			
<b>END OF CHAPTER 8</b>						
<a href="#">CLICK TO PROCEED TO CHAPTER 9 -&gt;</a>						

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Cooling

Practice #	Chapter 9: Indoor Environmental Quality	Points Available	Points Claimed	Status	Notes
<b>11.901 POLLUTANT SOURCE CONTROL</b>					
11.901.0	11.901.0 Intent. Pollutant sources are controlled.				
11.901.1	11.901.1 Space and water heating options				
11.901.1.1	11.901.1.1 Natural draft furnaces, boilers, or water heaters are not located in conditioned spaces, including conditioned crawlspaces, unless located in a mechanical room that has an outdoor air source and is sealed and insulated to separate it from the conditioned space(s).  (Points are awarded only for buildings that use natural draft combustion space or water heating equipment.)	5	0	<input type="checkbox"/>	
11.901.1.2	11.901.1.2 Air handling equipment or return ducts are not located in the garage, unless placed in isolated, air-sealed mechanical rooms with an outside air source. <b>Not available if there is no attached garage</b>	5	0	<input type="checkbox"/>	
11.901.1.3	11.901.1.3 The following combustion space heating or water heating equipment is installed within conditioned space:				
(1)	all furnaces or all boilers		0	<input type="checkbox"/>	
(a)	power vent furnace(s) or boiler(s)	3			
(b)	direct vent furnace(s) or boiler(s)	5			
(2)	all water heaters		0	<input type="checkbox"/>	
(a)	power vent water heater(s)	3			
(b)	direct vent water heater(s)	5			
11.901.1.4	11.901.1.4 Newly installed gas-fired fireplaces and direct heating equipment is listed and is installed in accordance with the NFPA 54, ICC IFGC, or the applicable local gas appliance installation code. Gas-fired fireplaces within dwelling units or sleeping units and direct heating equipment are vented to the outdoors. Alcohol burning devices and kerosene heaters are vented to the outdoors.	Mandatory		N/A	Verify all electric
11.901.1.5	11.901.1.5 Natural gas and propane fireplaces are direct vented, have permanently fixed glass fronts or gasketed doors, and comply with CSA Z21.88/CSA 2.33 or CSA Z21.50b/CSA 2.22b.	7	0	<input type="checkbox"/>	
11.901.1.6	11.901.1.6 The following electric equipment is installed:		5	<input checked="" type="checkbox"/>	Verify heat pumps
(1)	heat pump air handler in unconditioned space	2			
(2)	heat pump air handler in conditioned space	5			
11.901.2	11.901.2 Solid fuel-burning appliances				
11.901.2.1	11.901.2.1 Newly installed solid fuel-burning fireplaces, inserts, stoves and heaters are code compliant and are in accordance with the following requirements:				
(1)	Site-built masonry wood-burning fireplaces use outside combustion air and include a means of sealing the flue and the combustion air outlets to minimize interior air (heat) loss when not in operation.	N/A	4	0	<input type="checkbox"/>
(2)	Factory-built, wood-burning fireplaces are in accordance with the certification requirements of UL 127 and are an EPA Phase 2 Emission Level Qualified Model.	N/A	6	0	<input type="checkbox"/>
(3)	Wood stove and fireplace inserts, as defined in UL 1482 Section 3.8, are in accordance with the certification requirements of UL 1482 and are in accordance with the emission requirements of the EPA Certification and the State of Washington WAC 173-433-100(3).	N/A	6	0	<input type="checkbox"/>
(4)	Pellet (biomass) stoves and furnaces are in accordance with ASTM E1509 or are EPA certified.	N/A	6	0	<input type="checkbox"/>
(5)	Masonry heaters are in accordance with the definitions in ASTM E1602 and ICC IBC Section 2112.1.	N/A	6	0	<input type="checkbox"/>
11.901.2.2	11.901.2.2 Fireplaces, woodstoves, pellet stoves, or masonry heaters are not installed.	6	6	<input checked="" type="checkbox"/>	Verify, A109 roof plan calls for capping chimneys
11.901.3	11.901.3 Garages. Garages are in accordance with the following:				
(1)	Attached garage				
(a)	Where installed in the common wall between the attached garage and conditioned space, the door is tightly sealed and gasketed.	N/A	2	0	<input type="checkbox"/>
(b)	A continuous air barrier is provided between walls and ceilings separating the garage space from the conditioned living spaces.	N/A	2	0	<input type="checkbox"/>
(c)	For one- and two-family dwelling units, a 100 cfm (47 L/s) or greater ducted or 70 cfm (33 L/s) cfm or greater unducted wall exhaust fan is installed and vented to the outdoors and is designed and installed for continuous operation or has controls (e.g., motion detectors, pressure switches) that activate operation for a minimum of 1 hour when either human passage door or roll-up automatic doors are operated. For ducted exhaust fans, the fan airflow rating and duct sizing are in accordance with ASHRAE Standard 62.2-2007 Section 7.3.		8	0	<input type="checkbox"/>
(2)	A carport is installed, the garage is detached from the building, or no garage is installed.	10	10	<input checked="" type="checkbox"/>	None
11.901.4	11.901.4 Wood materials. A minimum of 85 percent of newly installed material within a product group (i.e., wood structural panels, countertops, composite trim/doors, custom woodwork, and/or component closet shelving) is manufactured in accordance with the following:	10 Max	0		
(1)	Structural plywood used for floor, wall, and/or roof sheathing is compliant with DOC PS 1 and/or DOC PS 2. OSB used for floor, wall, and/or roof sheathing is compliant with DOC PS 2. The panels are made with moisture-resistant adhesives. The trademark indicates these adhesives as follows: Exposure 1 or Exterior for plywood, and Exposure 1 for OSB. <b>NOTE: If "N/A" is selected, please explain in the Notes area.</b>	Mandatory		N/A	Not utilizing during remodel
(2)	Countertops				
(3)	Composite trim/doors				
(4)	Custom woodwork				
(5)	Component closet shelving				
(2)	Particleboard and MDF (medium density fiberboard) is manufactured and labeled in accordance with CPA A208.1 and CPA A208.2, respectively.	2			
(3)	Hardwood plywood in accordance with HPVA HP-1.	2			
(4)	Particleboard, MDF, or hardwood plywood is in accordance with CPA 4.	3			
(5)	Composite wood or agrifiber panel products contain no added urea-formaldehyde or are in accordance with the CARB Composite Wood Air Toxic Contaminant Measure Standard.	4			
(6)	Non-emitting products.	4			
11.901.5	11.901.5 Cabinets. A minimum of 85 percent of newly installed cabinets are in accordance with one or both of the following: <b>(Where both of the following practices are used, only 3 points are awarded.)</b>				
(1)	All parts of the cabinet are made of solid wood or non-formaldehyde emitting materials such as metal or glass.	5	0	<input type="checkbox"/>	
(2)	The composite wood used in wood cabinets is in accordance with CARB Composite Wood Air Toxic Contaminant Measure Standard or equivalent as certified by a third-party program such as, but not limited to, those in Appendix B.	3	0	<input type="checkbox"/>	
11.901.6	11.901.6 Carpets. Wall-to-wall carpeting is not installed adjacent to water closets and bathing fixtures.	Mandatory		<input checked="" type="checkbox"/>	A.701 calls for LVT

11.901.7	<p><b>11.901.7 Floor materials.</b> The following types of finished flooring materials are used. The materials have emission levels in accordance with CDPH/EHLB Standard Method v1.1. Product is tested by a laboratory with the CDPH/EHLB Standard Method v1.1 within the laboratory scope of accreditation to ISO/IEC 17025 and certified by a third-party program accredited to ISO 17065, such as, but not limited to, those in Appendix B.</p> <p>(Points are awarded for every 10% of conditioned floor space using one of the below materials.)</p> <p>(1) Hard surface flooring: Prefinished installed hard-surface flooring is installed. Where post-manufacture coatings or surface applications have not been applied, the following hard surface flooring types are deemed to comply with the emission requirements of this practice:</p> <p>(a) Ceramic tile flooring  (b) Organic-free, mineral-based flooring  (c) Clay masonry flooring  (d) Concrete masonry flooring  (e) Concrete flooring  (f) Metal flooring  (g) Glass</p> <p>(2) Carpet meeting and carpet cushion not meeting the emission limits is installed.</p> <p>(3) Carpet and carpet cushion meeting the emission limits is installed.</p> <p>(When carpet cushion meeting the emission limits of the practice is also installed, the percentage of compliant carpet area is calculated at 1.33 times the actual installed area.)</p>	1 8 Max	0	actual %:	
11.901.8	<p><b>11.901.8 Wall coverings.</b> When at least 10 percent of the interior wall surfaces are covered, a minimum of 85 percent of wall coverings are in accordance with the emission concentration limits of CDPH/EHLB Standard Method v1.1. Emission levels are determined by a laboratory accredited to ISO/IEC 17025 and the CDPH/EHLB Standard Method v1.1 is in its scope of accreditation. The product is certified by a third-party program accredited to ISO 17065, such as, but not limited to, those in Appendix B.</p>	4	0		
11.901.9	<p><b>11.901.9 Interior architectural coatings.</b> A minimum of 85 percent of newly applied interior architectural coatings are in accordance with either Section 11.901.9.1 or Section 11.901.9.3, not both. A minimum of 85 percent of architectural colorants are in accordance with Section 11.901.9.2.</p>				
11.901.9.1	<p><b>11.901.9.1 Site-applied interior architectural coatings,</b> which are inside the water proofing envelope, are in accordance with one or more of the following:</p> <p>(1) Zero VOC as determined by EPA Method 24 (VOC content is below the detection limit for the method)</p> <p>(2) GreenSeal GS-11</p> <p>(3) CARB Suggested Control Measure for Architectural Coatings (see Table 11.901.9.1).  <a href="#">See Table 11.901.9.1</a></p>	5	5	<input checked="" type="checkbox"/>	Verify
11.901.9.2	<p><b>11.901.9.2 Architectural coating colorant additive VOC content</b> is in accordance with Table 901.9.2.</p> <p>(Points for 11.901.9.2 are awarded only if base architectural coating is in accordance with 11.901.9.1.)  <a href="#">See Table 11.901.9.2</a></p>	1	0	<input type="checkbox"/>	
11.901.9.3	<p><b>11.901.9.3 Site-applied interior architectural coatings,</b> which are inside the waterproofing envelope, are in accordance with the emission levels of CDPH/EHLB Standard Method v1.1. Emission levels are determined by a laboratory accredited to ISO/IEC 17025 and the CDPH/EHLB Standard Method v1.1 in its scope of accreditation. The product is certified by a third-party program accredited to ISO 17065, such as, but not limited to, those found in Appendix B.</p>	8	0	<input type="checkbox"/>	
11.901.9.4	<p><b>11.901.9.4</b> When the building is occupied during the remodel, a minimum of 85 percent of the newly applied interior architectural coatings are in accordance with either 11.901.9.1 or 11.901.9.3.</p>	Mandatory		Met	Verify zero VOC
11.901.10	<p><b>11.901.10 Interior adhesives and sealants.</b> Interior low-VOC adhesives and sealants located inside the water proofing envelope: A minimum of 85 percent of newly applied site-applied products used within the interior of the building are in accordance with one of the following, as applicable.</p> <p>(1) The emission levels of CDPH/EHLB Standard Method v1.1. Emission levels are determined when tested by a laboratory accredited to ISO/IEC 17025 and the CDPH/EHLB Standard Method v1.1 is in its scope of accreditation. The product is certified by a third-party program accredited to ISO 17065, such as, but not limited to, those found in Appendix B.</p> <p>(2) GreenSeal GS-36.</p> <p>(3) SCAQMD Rule 1168 in accordance with Table 11.901.10(3), excluding products that are sold in 16 ounce containers or less and are regulated by the California Air Resources Board (CARB) Consumer Products Regulations.  <a href="#">See Table 11.901.10(3)</a></p>		0		
11.901.11	<p><b>11.901.11 Insulation.</b> Emissions of 85 percent of newly installed wall, ceiling, and floor insulation materials are in accordance with the emission levels of CDPH/EHLB Standard Method v1.1. Emission levels are determined by a laboratory accredited to ISO/IEC 17025 and the CDPH/EHLB Standard Method v1.1 is in its scope of accreditation. Insulation is certified by a third-party program accredited to ISO 17065, such as, but not limited to, those in Appendix B.</p>	4	0	<input type="checkbox"/>	
11.901.12	<p><b>11.901.12 Furniture and Furnishings.</b> In a multifamily building, all furniture in common areas shall have VOC emission levels in accordance with ANSI/BIFMA e3-Furniture Sustainability Standard sections 7.6.1 and 7.6.2, tested in accordance with ANSI/BIFMA Standard Method M7.1. Emission levels are determined by a laboratory accredited to ISO/IEC 17025 and the ANSI/BIFMA Standard Method M7.1 is in its scope of accreditation. Furniture and Furnishings are certified by a third-party program accredited to ISO 17065, such as, but not limited to, those in Appendix B.</p>	2	0	<input type="checkbox"/>	
11.901.13	<p><b>11.901.13 Carbon monoxide (CO) alarms.</b> A carbon monoxide (CO) alarm is provided in accordance with the IRC Section R315.</p>	Mandatory		Built to IBC	Verify
11.901.14	<p><b>11.901.14 Building entrance pollutants control.</b> Pollutants are controlled at all main building entrances by one of the following methods:</p> <p>(1) Exterior grilles or mats are installed in a fixed manner and may be removable for cleaning.</p> <p>(2) Interior grilles or mats are installed in a fixed manner and may be removable for cleaning.</p>	1 1	0	<input type="checkbox"/> <input type="checkbox"/>	
11.901.15	<p><b>11.901.15 Non-smoking areas.</b> Environmental tobacco smoke is minimized by one or more of the following:</p> <p>(1) All interior common areas of a multifamily building are designated as non-smoking areas with posted signage.</p> <p>(2) Exterior smoking areas of a multifamily building are designated with posted signage and located a minimum of 25 feet from entries, outdoor air intakes, and operable windows.</p>	1 1	0	<input type="checkbox"/> <input type="checkbox"/>	
11.901.16	<p><b>11.901.16 Lead-safe work practices.</b> For buildings constructed before 1978, lead-safe work practices are used during the remodeling.</p>	Mandatory		<input type="checkbox"/>	

**11.902 POLLUTANT CONTROL**

11.902.0	11.902.0 Intent: Pollutants generated in the building are controlled.				
11.902.1	<b>11.902.1 Spot ventilation.</b>				
11.902.1.1	11.902.1.1 Spot ventilation is in accordance with the following:				
(1)	Bathrooms are vented to the outdoors. The minimum ventilation rate is 50 cfm (23.6 L/s) for intermittent operation or 20 cfm (9.4 L/s) for continuous operation in bathrooms.	Mandatory	Met	Verify	
(a)	A window complying with IRC Section R303.3 is provided in addition to mechanical ventilation.	1	0	<input type="checkbox"/>	
(2)	Clothes dryers (except listed and labeled condensing ductless dryers) are vented to the outdoors.	Mandatory	Met	Verify	
(3)	Kitchen exhaust units and/or range hoods are ducted to the outdoors and have a minimum ventilation rate of 100 cfm (47.2 L/s) for intermittent operation or 25 cfm (11.8 L/s) for continuous operation.	8	8	<input checked="" type="checkbox"/>	Verify, A.511 note 11c calls for ducted range hood
11.902.1.2	11.902.1.2 Bathroom and/or laundry exhaust fan is provided with an automatic timer and/or humidistat:				
(1)	for first device	11 Max	0	# of timers:	
(2)	for each additional device	5		# of humidistats:	
11.902.1.3	11.902.1.3 Kitchen range, bathroom, and laundry exhaust are verified to air flow specification. Ventilation airflow at the point of exhaust is tested to a minimum of:				
(a)	100 cfm (47.2 L/s) intermittent or 25 cfm (11.8 L/s) continuous for kitchens, and	8	8	<input checked="" type="checkbox"/>	
(b)	50 cfm (23.6 L/s) intermittent or 20 cfm (9.4 L/s) continuous for bathrooms and/or laundry				
11.902.1.4	11.902.1.4 Exhaust fans are ENERGY STAR, as applicable.				
(1)	ENERGY STAR, or equivalent, fans operating above 1 sone	12 Max	4	# of fans:	Verify
(2)	ENERGY STAR, or equivalent, fans operating at or below 1 sone	(Points awarded per fan.) 2		2 fan(s)	
11.902.1.5	11.902.1.5 Fenestration in spaces other than those identified in 902.1.1 through 902.1.4 are designed for stack effect or cross-ventilation in accordance with all of the following:				
(1)	Operable windows, operable skylights, or sliding glass doors with a total area of at least 15 percent of the total conditioned floor area are provided.	3	0	<input type="checkbox"/>	
(2)	Insect screens are provided for all operable windows, operable skylights, and sliding glass doors.			<input type="checkbox"/>	
(3)	A minimum of two operable windows or sliding glass doors are placed in adjacent or opposite walls. If there is only one wall surface in that space exposed to the exterior, the minimum windows or sliding glass doors may be on the same wall.			<input type="checkbox"/>	
11.902.1.6	11.902.1.6 Ventilation for Multifamily Common Spaces. Systems are implemented and are in accordance with the specifications of ASHRAE 62.1 and an explanation of the operation and importance of the ventilation system is included in 1002.1 and 1002.2 of NGBS.				
11.902.2	<b>11.902.2 Building ventilation systems.</b>				
11.902.2.1	11.902.2.1 One of the following whole building ventilation systems is implemented and is in accordance with the specifications of ASHRAE Standard 62.2-2010 Section 4 and an explanation of the operation and importance of the ventilation system is included in either 11.1001.1(9) or 11.1002.2(11).				
(1)	exhaust or supply fan(s) ready for continuous operation and with appropriately labeled controls	Mandatory	0	N/A (high leakage)	Verify
(2)	balanced exhaust and supply fans with supply intakes located in accordance with the manufacturer's guidelines so as to not introduce polluted air back into the building	3			
(3)	heat-recovery ventilator	6			
(4)	energy-recovery ventilator	7			
(5)	Ventilation air is preconditioned by a system not specified above	8			
11.902.2.2	11.902.2.2 Ventilation airflow is tested to achieve the design fan airflow in accordance with ANSI/RESNET/CC 280 and Section 11.902.2.1.				
(1)		4	0	<input type="checkbox"/>	
11.902.2.3	11.902.2.3 MERV filters 8 to 13 are installed on central forced air systems and are accessible. Designer or installer is to verify that the HVAC equipment is able to accommodate the greater pressure drop of MERV 8 to 13 filters.				
(1)		2	0	<input type="checkbox"/>	
11.902.2.4	11.902.2.4 MERV filters 14 or greater are installed on central forced air systems and are accessible. Designer or installer is to verify that the HVAC equipment is able to accommodate the greater pressure drop of the filter used.				
(1)		3	0	<input type="checkbox"/>	
11.902.2.5	11.902.2.5 All HVAC filter locations are designed such that they are readily accessible to the occupant.				
(1)		3	0	<input type="checkbox"/>	

11.902.3	<b>11.902.3 Radon reduction measures.</b> Radon reduction measures are in accordance with IRC Appendix F or § 11.902.3.1. Radon Zones as identified by the AHJ or, if the zone is not identified by the AHJ, as defined in Figure 9(1). This practice is not mandatory if the existing building has been tested for radon and is in accordance with federal and local acceptable limits.	Mandatory	N/A	Verify none
(1)	Buildings located in Zone 1		0	
(a)	a passive radon system is installed	N/A		
(b)	an active radon system is installed	12		
(2)	Buildings located in Zone 2 or Zone 3		0	
(a)	a passive or active radon system is installed	6		
(b)	an active radon system is installed	12		
11.902.3.1	<b>11.902.3.1 Radon reduction option.</b> This option requires section 11.902.3.1.1 through 11.902.3.1.7.			
11.902.3.1.1	<b>11.902.3.1.1 Soil-gas barriers and base course.</b> A base course in accordance with Section 506.2.2 of the IRC shall be installed below slabs and foundations. There shall be a continuous gas-permeable base course under each soil-gas retarder that is separated by foundation walls or footings. Between slabs and the base course, damp proofing or water proofing shall be installed in accordance with Section 406 of the IRC. Penetrations, tears and gaps around penetrations of the soil-gas retarder shall be repaired or covered with an additional soil-gas retarder. The soil-gas retarder shall be a continuous 6-mil (0.15 mm) polyethylene or an approved equivalent.			
11.902.3.1.2	<b>11.902.3.1.2 Soil gas collection.</b> There shall be an unobstructed path for soil gas flow between the void space installed in the base course and the vent through the roof. Soil gases below the foundation shall be collected by a perforated pipe with a diameter of not less than 4 inches (10 cm) and not less than 5 feet (1.5 m) in total length. A tee fitting or equivalent method shall provide two horizontal openings to the radon collection. The tee fitting shall be designed to prevent clogging of the radon collection path. Alternately the soil gas collection shall be by approved radon collection mats or an equivalent approved method.			
11.902.3.1.3	<b>11.902.3.1.3 Soil gas entry routes.</b> Openings in slabs, soil-gas retarders, and joints such as, but not limited to, plumbing, ground water control systems, soil-gas vent pipes, piping and structural supports, shall be sealed against air leakage at the penetrations. The sealant shall be a polyurethane caulk, expanding foam or other approved method. Foundation walls shall comply with Section 103.2.3 of the IRC. Sumps shall be sealed in accordance with Section 103.2.2 of the IRC. Sump pits and sump lids intended for ground water control shall not be			
11.902.3.1.4	<b>11.902.3.1.4 Soil gas vent.</b> A gas-tight pipe vent shall extend from the soil gas permeable layer through the roof. The vent pipe size shall not be reduced at any location as it goes from gas collection to the roof. Exposed and visible interior vent pipes shall be identified with not less than one label reading "Radon Reduction System" on each floor and in habitable attics.			
11.902.3.1.5	<b>11.902.3.1.5 Vent pipe diameter.</b> The minimum vent pipe diameter shall be as specified in Table 11.902.3.1.5.			
11.902.3.1.6	<b>11.902.3.1.6 Multiple vented areas.</b> In dwellings where interior footings or other barriers separate the soil-gas permeable layer, each area shall be fitted with an individual vent pipe. Vent pipes shall connect to a single vent that terminates above the roof or each individual vent pipe shall terminate separately above the roof.			
11.902.3.1.7	<b>11.902.3.1.7 Fan.</b> Each sub-slab soil-gas exhaust system shall include a fan, or dedicated space for the post-construction installation of a fan. The electrical supply for the fan shall be located within 6 feet (1.8 m) of the fan. Fan is not required to be on a dedicated circuit.			
11.902.3.2	<b>11.902.3.2 Radon testing.</b> Radon testing is mandatory for Zone 1. <b>Exceptions:</b> (2) Testing is not mandatory where the occupied space is located above an unenclosed open space.			Exception: <input type="checkbox"/>
(1)	Testing specifications. Testing is performance as specified in (a) through (j). Testing of a representative sample shall be permitted for multifamily buildings only.	8	0	Test results (pCi/L): <input type="checkbox"/>
(a)	Testing is performed after the residence passes its airtightness test.			
(b)	Testing is performed after the radon control system installation is complete. If the system has an active fan, the residence shall be tested with the fan operating.			
(c)	Testing is performed at the lowest level within a dwelling unit which will be occupied, even if the space is not finished.			
(d)	Testing is not performed in a closet, hallway, stairway, laundry room, furnace room, kitchen, or bathroom.			
(e)	Testing is performed with a commercially available test kit or with a continuous radon monitor that can be calibrated. Testing shall be in accordance with the testing device manufacturer's instructions.			
(f)	Testing shall be performed by the builder, a registered design professional, or an approved third party.			
(g)	Testing shall extend at least 48 hours or to the minimum specified by the manufacturer, which ever is longer.			
(h)	Written radon test results shall be provided by the test lab or testing party. Written test results shall be included with construction documents.			
(i)	An additional pre-paid test kit shall be provided for the homeowner to use when they choose. The test kit shall include mailing or emailing the results from the testing lab to the homeowner.			
(j)	Where the radon test result is 4 pCi/L or greater, the fan for the radon vent pipe shall be installed.			
(2)	Testing results. A radon test done in accordance with 11.902.3 and completed before occupancy receives a results of 2 pCi/L or less.	6	0	
11.902.4	<b>11.902.4 HVAC system protection.</b> One of the following HVAC system protection measures is performed.	3	0	
(1)	HVAC supply registers (boots), return grilles, and rough-ins are covered during construction activities to prevent dust and other pollutants from entering the system.			<input type="checkbox"/>
(2)	Prior to owner occupancy, HVAC supply registers (boots), return grilles, and duct terminations are inspected and vacuumed. In addition, the coils are inspected and cleaned and the filter is replaced if necessary.			<input type="checkbox"/>
(3)	If HVAC systems are to be operated, during construction, all return grilles have a temporary MERV 8 or higher filter installed in a manner ensuring no leakage around the filter.			<input type="checkbox"/>
11.902.5	<b>11.902.5 Central vacuum systems.</b> Central vacuum system is installed and vented to the outside.	3	0	<input type="checkbox"/>
11.902.6	<b>11.902.6 Living space contaminants.</b> The living space is sealed in accordance with Section 11.701.4.3.1 to prevent unwanted contaminants.	Mandatory	<input checked="" type="checkbox"/>	See 11.701.4.3.1

**11.903 MOISTURE MANAGEMENT: VAPOR, RAINWATER, PLUMBING, HVAC**

<b>11.903.0</b>		<b>11.903.0 Intent:</b> Moisture and moisture effects are controlled.			
<b>11.903.1</b>	<b>11.903.1 Plumbing.</b> Plumbing is in accordance with one of the following:	5	[2]	Verify	
(1)	Cold water pipes in unconditioned spaces are insulated to a minimum of R-4 with pipe insulation or other covering that adequately prevents condensation.	2			
(2)	Plumbing is not installed in unconditioned spaces.	5			
<b>11.903.2</b>	<b>11.903.2 Duct insulation.</b> Ducts are in accordance with one of the following:	1	[1]	Verify	
(1)	All HVAC ducts, plenums, and trunks are located in conditioned space.	1			
(2)	All HVAC ducts, plenums, and trunks are in conditioned space. All HVAC ducts are insulated to a minimum of R4.	3			
<b>11.903.3</b>	<b>11.903.3 Relative humidity.</b> In climate zones 1A, 2A, 3A, 4A, and 5A, equipment is installed to maintain relative humidity (RH) at or below 60 percent using one of the following:	7	0		
(1)	additional dehumidification system(s)		<input type="checkbox"/>		
(2)	central HVAC system equipped with additional controls to operate in dehumidification mode		<input type="checkbox"/>		

**11.904 INDOOR AIR QUALITY**

<b>11.904.0</b>		<b>11.904.0 Intent:</b> IAQ is protected by best practices to control ventilation, moisture, pollutant sources and sanitation.			
<b>11.904.1</b>	<b>11.904.1 Indoor Air Quality (IAQ) During Construction.</b> Wood is dry before close-in (11.602.1.7.1(3)), materials comply with emission criteria (11.901.4-11.901.11), sources of water infiltration or condensation observed during construction have been eliminated, accessible interior surfaces are dry and free of visible suspect growth (per ASTM D7338-10 section 6.3), and water damage (per ASTM D7338-10 section 7.4.3).	2	0		
<b>11.904.2</b>	<b>11.904.2 Indoor Air Quality (IAQ) Post Completion.</b> Verify there are no moisture, mold, and dust issues per 11.602.1.7.1(3), 11.901.4-11.901.11, ASTM D7338 Section 6.3, and ASTM D7338 Section 7.4.3.	3	0		
<b>11.904.3</b>	<b>11.904.3 Microbial growth &amp; moisture inspection and remediation.</b> A visual inspection is performed to confirm the following:				
(1)	Verify that no visible signs of discoloration and microbial growth on ceilings, walls or floors, or other building assemblies Or If minor microbial growth is observed (less than within a total area of 25 square feet) in homes or multifamily buildings, reference EPA Document 402-K-02-003 (A Brief Guide to Mold, Moisture, and Your Home) for guidance on how to properly remediate the issue. If microbial growth is observed, on a larger scale in homes or multifamily buildings (greater than 25 sq ft), reference EPA document 402-k-01-001 (Mold Remediation in Schools and Commercial Buildings) for guidance on how to properly remediate the issue.	Mandatory	<input checked="" type="checkbox"/>	Verify	
(2)	Verify that there are no visible signs of water damage or pooling. If signs of water damage or pooling are observed, verify that the source of the leak has been repaired, and that damaged materials are either properly dried or replaced as needed.	Mandatory	<input checked="" type="checkbox"/>	Verify	

**11.905 INNOVATIVE PRACTICES**

<b>11.905.1</b>	<b>11.905.1 Humidity monitoring system.</b> A humidity monitoring system is installed with a mobile base unit that displays readings of temperature and relative humidity. The system has a minimum of two remote sensor units. One remote sensor unit is placed permanently inside the conditioned space in a central location, excluding attachment to exterior walls, and another remote sensor unit is placed permanently outside of the conditioned space.	2	0		
<b>11.905.2</b>	<b>11.905.2 Kitchen exhaust.</b> A kitchen exhaust unit(s) that equals or exceeds 400 cfm (189 L/s) is installed, and makeup air is provided.	2	0		
<b>11.905.3</b>	<b>11.905.3 Enhanced air filtration.</b> Meet all of the following:	2	0		
(1)	Design for and install a secondary filter rack space for activated carbon filters.		<input type="checkbox"/>		
(2)	Provide the manufacturer's recommended filter maintenance schedule to the homeowner or building manager.		<input type="checkbox"/>		
<b>11.905.4</b>	<b>11.905.4 Sound barrier.</b> Provide room-to-room privacy between bedrooms and adjacent living spaces within dwelling units or homes by achieving an articulation index (AI) between 0 and 0.15 per the criteria below. <i>Articulation Index 0 to 0.05 = STC greater than 55 (NIC greater than 47)</i> <i>Articulation Index 0.05 to 0.15 = STC 52 to 55 (NIC 44 to 47)</i>	1 SF / 4 MF	0		
<b>11.905.5</b>	<b>11.905.5 Evaporative coil mold prevention.</b> For buildings with a mechanical system for cooling, ultraviolet lamps are installed on the cooling coils and drain pans of the mechanical system supplies. Lamps produce ultraviolet radiation at a wavelength of 254 nm so as not to generate ozone. Lamps have ballasts housed in a NEMA-rated enclosure.	2	0		
<b>11.905.6</b>	<b>11.905.6 Isolation of areas to be remodeled.</b> To protect unrenovated spaces, meet one of the following:	3 max	0		
(1)	Remodeled space is isolated from unrenovated space by masking of openings and hvac returns and providing strip doors.	1			
(2)	Remodeled space is isolated from unrenovated space by masking of openings and hvac returns, and providing strip doors and the space is negatively pressurized by ducting exhaust to the exterior.	3			
(3)	Remodeled space is isolated from unrenovated space by masking of openings and hvac returns, and providing strip doors and a dedicated HEPA filtration system is installed.	3			

END OF CHAPTER 9

[CLICK TO PROCEED TO CHAPTER 10 >>](#)

Total Chapter Points: 16
Total Project Points: 183
Total Project Level: Silver
Points Needed to Earn Next Level: 42
Revision Date: 12/11/2024



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Coding

Practice #	Chapter 10: Operation, Maintenance, and Building Owner Education	Points Available	Points Claimed	Status	Notes
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**11.1001 HOMEOWNER'S MANUAL AND TRAINING GUIDELINES FOR ONE- AND TWO-FAMILY DWELLINGS**

**11.1001.0** **11.1001.0 Intent.** Information on the building's use, maintenance, and green components is provided.

11.1001.1	11.1001.1 A homeowner's manual is provided and stored in a permanent location in the dwelling that includes the following, as available and applicable.	1 8 Max	0
	(Points awarded per two items. Points awarded for non-mandatory items.)		
(1)	A National Green Building Standard certificate with weblink and completion document.	N/A	<input type="checkbox"/>
(2)	List of green building features (can include the national green building checklist).	N/A	<input type="checkbox"/>
(3)	Product manufacturer's manuals or product data sheet for newly installed major equipment, fixtures, and appliances including product model numbers and serial numbers. If product data sheet is in the building owners' manual, manufacturer's manual may be attached to the appliance in lieu of inclusion in the building owners' manual.	N/A	<input type="checkbox"/>
(4)	Maintenance checklist.		<input type="checkbox"/>
(5)	Information on local recycling and composting programs.		<input type="checkbox"/>
(6)	Information on available local utility programs that purchase a portion of energy from renewable energy providers.		<input type="checkbox"/>
(7)	Explanation of the benefits of using energy-efficient lighting systems [e.g., compact fluorescent light bulbs, light emitting diode (LED)] in high-usage areas.		<input type="checkbox"/>
(8)	A list of practices to conserve water and energy.		<input type="checkbox"/>
(9)	Information on the importance and operation of the home's fresh air ventilation system.		<input type="checkbox"/>
(10)	Local public transportation options.		<input type="checkbox"/>
(11)	A diagram showing the location of safety valves and controls for major building systems.		<input type="checkbox"/>
(12)	Where frost-protected shallow foundations are used, owner is informed of precautions including: <ul style="list-style-type: none"> <li>(a) instructions to not remove or damage insulation when modifying landscaping.</li> <li>(b) providing heat to the building as required by the ICC IRC or IBC.</li> <li>(c) keeping base materials beneath and around the building free from moisture caused by broken water pipes or other water sources.</li> </ul>		<input type="checkbox"/>
(13)	A list of local service providers that offer regularly scheduled service and maintenance contracts to ensure proper performance of equipment and the structure (e.g., HVAC, water-heating equipment, sealants, caulks, gutter and downspout system, shower and/or tub surrounds, irrigation system).		<input type="checkbox"/>
(14)	A photo record of framing with utilities installed. Photos are taken prior to installing insulation, clearly labeled, and included as part of the building owners' manual.		<input type="checkbox"/>
(15)	List of common hazardous materials often used around the building and instructions for proper handling and disposal of these materials.		<input type="checkbox"/>
(16)	Information on organic pest control, fertilizers, deicers, and cleaning products.		<input type="checkbox"/>
(17)	Information on native landscape materials and/or those that have low water requirements.		<input type="checkbox"/>
(18)	Information on methods of maintaining the building's relative humidity in the range of 30 percent to 60 percent.		<input type="checkbox"/>
(19)	Instructions for inspecting the building for termite infestation.		<input type="checkbox"/>
(20)	Instructions for maintaining gutters and downspouts and importance of diverting water a minimum of 5 feet away from foundation.		<input type="checkbox"/>
(21)	A narrative detailing the importance of maintenance and operation in retaining the attributes of a green-built building.		<input type="checkbox"/>
(22)	Where stormwater management measures are installed on the lot, information on the location, purpose, and upkeep of these measures.		<input type="checkbox"/>
(23)	For buildings originally built before 1978, the EPA publications "Reducing Lead Hazards When Remodeling Your Home" and "Asbestos in Your Home: A Homeowner's Guide".		<input type="checkbox"/>
(24)	Explanation of and benefits from green cleaning in the home.		<input type="checkbox"/>
(25)	Retrofit energy calculator that provides baseline for future energy retrofits.		<input type="checkbox"/>

**11.1001.2** **11.1001.2 Training of initial homeowners.** Initial homeowners are familiarized with the role of occupants in achieving green goals. Training is provided to the responsible party(ies) regarding equipment operation and maintenance, control systems, and occupant actions that will improve the environmental performance of the building. These include:

- (1) HVAC filters.
- (2) Thermostat operation and programming.
- (3) Lighting controls.
- (4) Appliances operation.
- (5) Water heater settings and hot water use.
- (6) Fan controls.
- (7) Recycling and composting practices.
- (8) Whole-dwelling mechanical ventilation systems

N/A  
8  
0



11.1002.4	<b>11.1002.4 Training of building owners.</b> Building owners are familiarized with the role of occupants in achieving green goals. On-site training is provided to the responsible party(ies) regarding newly installed equipment operation and maintenance, control systems, and occupant actions that will improve the environmental performance of the building. These include:	Mandatory	8	8	<input checked="" type="checkbox"/>	Build-to-Rent? <input type="checkbox"/>	
	(1) HVAC filters						
	(2) thermostat operation and programming						
	(3) lighting controls						
	(4) appliances operation						
	(5) water heater settings and hot water use						
	(6) fan controls						
	(7) recycling and composting practices						
	(8) Whole-dwelling mechanical ventilation system						
11.1002.5	<b>11.1002.5 Multifamily occupant manual.</b> An occupant manual is compiled and distributed in accordance with Section 1002.0. <i>[Points awarded for non-mandatory items.]</i>		1 per 2 items	0		Build-to-Rent? <input type="checkbox"/>	
	(1) NGBS certificate	Mandatory				<input checked="" type="checkbox"/>	
	(2) List of green building features	Mandatory				<input checked="" type="checkbox"/>	
	(3) Operations manuals for all appliances and occupant operated equipment including lighting and ventilation controls, thermostats, etc.	Mandatory				<input checked="" type="checkbox"/>	
	(4) Information on recycling and composting programs					<input type="checkbox"/>	
	(5) Information on purchasing renewable energy from utility					<input type="checkbox"/>	
	(6) Information on energy efficient replacement lamps					<input type="checkbox"/>	
	(7) List of practices to save water and energy					<input type="checkbox"/>	
	(8) Local public transportation options					<input type="checkbox"/>	
	(9) Explanation of benefits of green cleaning					<input type="checkbox"/>	
11.1002.6	<b>11.1002.6 Training of multifamily occupants.</b> Prepare a training outline, video or website that familiarizes occupants with their role in maintaining the green goals of the project. Include all equipment that the occupant(s) is expected to operate including but not limited.		1 per 2 items	0		Build-to-Rent? <input type="checkbox"/>	
	(1) Lighting controls					<input type="checkbox"/>	
	(2) Ventilation controls					<input type="checkbox"/>	
	(3) Thermostat operation and programming					<input type="checkbox"/>	
	(4) Appliances operation					<input type="checkbox"/>	
	(5) Recycling and composting					<input type="checkbox"/>	
	(6) HVAC filters					<input type="checkbox"/>	
	(7) Water heater setting and hot water use					<input type="checkbox"/>	
<b>11.1003 PUBLIC EDUCATION</b>							
11.1003.0	<b>11.1003.0 Intent.</b> Increase public awareness of the National Green Building Standard and projects constructed in accordance with National Green Building Standard to help increase demand for high-performance homes.						
11.1003.1	<b>11.1003.1 Public Education.</b> One or more of the following is implemented:		2 Max	0			
	(1) <b>Signage.</b> Signs showing the project is designed and built in accordance with the National Green Building Standard are posted on the construction site.		1			<input type="checkbox"/>	
	(2) <b>Certification Plaques.</b> National Green Building Standard certification plaques with rating level attained are placed in a conspicuous location near the utility area of the home or, in a conspicuous location near the main entrance of a multifamily building.		1			<input type="checkbox"/>	
	(3) <b>Education.</b> A URL for the National Green Building Standard is included on site signage, builder website (or property website for multifamily buildings), and marketing materials for homes certified under the National Green Building Standard.		1			<input type="checkbox"/>	
<b>11.1005 INNOVATIVE PRACTICES</b>							
11.1005.1	<b>11.1005.1 Appraisals.</b> One or more of the following is implemented:						
	(1) Energy rating or projected usage data is posted in an appropriate location in the home, or public posting so that an appraiser can access the energy data for an energy efficiency property valuation.		2	0		<input type="checkbox"/>	
	(2) An Appraisal Institute Form 820.05 "Residential Green and Energy Addendum" or Form 821 "Commercial Green and energy Efficient Addendum" that consider NGBS, LEED, ENERGY STAR certifications and equivalent programs, is completed for the appraiser by a qualified professional or builder to use in performing the valuation of the property.		2	0		<input type="checkbox"/>	
	(3) NGBS certification information or one of the Appraisal Institute Forms cited in (2) above is uploaded to a multiple listing service (MLS) or equivalent database so that appraisers can access it to compare property valuations.		2	2			Home Innovation makes key certification details available, but MLS organizations need to take affirmative action to ensure data is received and made publicly available. Contact us for more details.
<b>END OF CHAPTER 10</b>							

**SECTION 01 10 00.05 – GENERAL WAGE DECISION****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
- B. The applicable wage decision will be inserted prior to closing.

State: Michigan

Construction Type: Building

County: Wayne County in Michigan.

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 4026 or Executive Order 13658.

Please note that these Executive Orders apply to covered contracts entered by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60).

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive orders is available at <http://www.dol.gov/whd/govcontracts>.

**PART 2 - PRODUCTS (Not Used)****PART 3 - EXECUTION (Not Used)**

**END OF SECTION 01 00 00.05**

## SECTION 01 10 00.06 GENERAL REQUIREMENTS

## PART 1 - GENERAL

## A. GENERAL

1. The AIA General Conditions, the MSHDA General Conditions of The Contract, Supplementary General Conditions, Special Conditions and these General Requirements shall be considered as an inclusive part of each division of these specifications. All subcontractors as well as the General Contractor shall be governed by all applicable sections of these documents with reference to their respective areas of work. It shall be the responsibility of the General Contractor to apprise all subcontractors and suppliers of these requirements.
2. Where the specifications refer to products of one or more manufacturers, such references designate the type, quality, size, grade, style, etc. of materials or equipment to be furnished and are not intended to restrict competitive bidding. Written approval of the Architect must be secured for use of any alternate material or product.
3. The drawings and these specifications are intended to be complementary, what is called for by either shall be as binding as if called for by both. Any discrepancies found between the drawings and the specifications shall be brought to the attention of the Architect for the interpretation of the intent of the contract documents.
4. **It shall be the responsibility of the General Contractor and all subcontractors to have examined and reviewed the site and the complete set of working drawings and specifications and to provide all labor and material for their respective area of work for a complete and finished installation in compliance with the intent of the drawings and specifications whether indicated or not, shall be in compliance with all codes and ordinances that are applicable to the project. Costs for permits, bonds, fees, etc., shall be the responsibility of each subcontractor.**  
**Submittal of the proposal implies that the Bidder is fully conversant with all requirements of all said Divisions and Documents. No claims for additional compensation will be entertained or paid to any Contractor or Subcontractor on account of his failure to be fully informed of all requirements of all documents.**
5. The General Contractor shall keep a competent superintendent on the site at all times during the entire progress of the work.

6. Subcontractors shall cooperate with each other and with the General Contractor to provide materials and labor that are necessary in each other's work at the proper times so that the construction schedule is not affected. These interfacing shall be the responsibility of the subcontractors whose work is affected as such.
7. Every subcontractor is to remove his own debris from the job site and to keep areas of this work in broom swept condition as directed by the job superintendent.
8. In no instance shall any contractor or subcontractor substitute any material or process stipulated or scheduled in these Specifications or the Drawings without prior written approval of Architect. In preparation of Bid Proposals, should any subcontractor desire to change or substitute any material or construction process utilized in Contract Drawings and Specifications, he may request same upon written notification to Architect and by identifying in his Bid Proposal any such proposed changes, alterations or omissions.

Where the specifications refer to products of one or more manufacturers, such references designate the type, quality, size, grade, style, etc., of materials or equipment to be furnished and are not intended to restrict competitive bidding. The written approval of the Architect must be secured for use of any alternate material or product.

9. Shop drawings - six sets of shop drawings, bound in sequence shall be submitted for each separate portion of the work. Shop drawings shall be submitted to the General Contractor who shall review, stamp and sign approved each submittal prior to submittal to the Architect. Data submitted shall show proposed equipment only and shall not be catalogs showing a manufacturer's complete line. A minimum of three samples shall be submitted unless additional samples are requested. All shop drawings and samples shall be identified with the job name and shall be accompanied by a letter of transmittal containing a complete list of the submitted material. Shop drawings found to be inaccurate or otherwise in error shall be returned to the subcontractor for correction before submitting them to the Architect.

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.

- a. 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.

- b. Intermediate Review: If intermediate submittal is necessary, process it in the same manner as an initial submittal.
- c. Resubmittal Review: Allow 7 days for review of each resubmittal.
- d. Allow an additional 15 day review time for intensive submittals which require sequential or multiple consultant reviews, such as Structural Steel, Door & Hardware, Lighting submittals, etc.

#### **B. LAYING OUT WORK**

1. The General Contractor shall locate and provide all general reference points and take ordinary precautions to prevent their destruction. Each subcontractor shall be responsible for laying out his own work and shall be responsible for all lines, elevations measurements, grading and other as may be required by his work. He shall be held responsible for verifying all figures and details shown on the drawings, which relate to his work, prior to laying out the work. He will be held responsible for any error resulting from this failure to take such precautions.
2. The General Contractor shall be responsible for establishing field benchmarks for the purpose of establishing required elevations. The stakes shall be sufficiently far enough away from the work so as not to be disturbed.

#### **C. TEMPORARY FIELD OFFICE**

The General Contractor shall provide and maintain a watertight field office for his own use and that of the Architect, the Owner and the MSHDA representative for the duration of the project. The office shall be properly heated, lighted and equipped with tables, filing space for drawings and a telephone.

#### **D. FIELD DRAWINGS AND RECORD DRAWINGS**

A complete set of working drawings shall be maintained by the General Contractor on the site and shall be updated regularly. All changes and/or modifications made in the field must be recorded by the General Contractor and each subcontractor on their own field set as soon as the change is made, and immediately thereafter, recorded on the General Contractor's field set. This shall comprise an accurate set of marked-up drawings of the project, insofar as the actual construction or installation differs from the Contract Drawings. These "record" drawings are required at the time of Substantial Completion, and shall be turned over to the Architect at that time for the purpose of recording changes on the original working drawings.

#### **E. STORAGE SHEDS**

Prime subcontractors shall furnish storage facilities large enough to hold all materials that might be subject to damage or vandalism, that are required on the site at any one time. The facilities shall be adequately constructed so as to prevent damage from the elements and so they can be adequately secured. Location on the site shall be as per the General Contractor's instructions. Each subcontractor shall bear the responsibility for the security of his own materials and equipment.

#### **F. SAFE PREMISES**

1. It shall be the responsibility of each subcontractor to maintain all areas adjacent to the construction site in a manner not to hinder or endanger normal traffic flow, or endanger or damage adjacent property.
2. Streets and sidewalks adjacent to the site shall be kept clean and open for pedestrian and vehicular traffic. Warning lights, guards and barricades shall be utilized and maintained as required to ensure these conditions by the subcontractor whose work is partially or totally in the above stated area. General Contractor shall provide for all temporary walk areas required for access to the building area and as necessary to carry out the work.
3. If necessary, due to soil conditions, the responsible subcontractor shall provide cribbing and shoring for excavations which might endanger workmen, equipment, or adjacent property.
4. The responsible subcontractor is to provide scaffolding necessary for all his work. All scaffolding must be built in accordance with the requirements of federal, state and local regulations.
5. Temporary stairs, ladders and ramps shall be provided by the subcontractor for his work in order to safely enable access to all parts of the work by the Architect, the MSHDA representative, the Owner and any authorized inspecting personnel. All such equipment shall meet all federal, state and local safety requirements.

#### **G. TEMPORARY LIGHT AND POWER**

The electrical subcontractor shall provide all temporary electric service and lighting required during the entire construction period and pay for all costs for installing, maintaining and removing temporary service. Include all necessary temporary wiring, panelboards, outlets, switches, lamps, fuses, controls and accessories. Provide a sufficient number of electric outlets located so that 50-foot-long extension cords will reach all work requiring light or power. All temporary 120 V, 15 and 20 amp receptacle outlets shall be G.F.I. protected. All temporary service equipment shall be removed by the Electrical subcontractor when so instructed by the General Contractor. The General Contractor shall be responsible for payment of the electric bill.

**H. TEMPORARY WATER**

The General Contractor shall pay for all water required during the entire construction period. The site utilities subcontractor shall pay tap fees and shall lay a temporary water line from the source, fit with a hose bibb, and shall provide and maintain all valves, connections and hoses.

The General Contractor shall furnish drinking water from an approved source for all persons on the work. Each subcontractor shall be responsible to provide containers for his own men.

If the use period for the temporary water installation includes freezing weather, the site utilities subcontractor shall provide insulation for all exposed temporary service piping to prevent freezing.

**I. TEMPORARY HEAT**

Each subcontractor shall provide temporary heat as necessary to protect all of his work and materials from damaging dampness and freezing. Temperatures shall be maintained as per ASTM requirements. Precautions shall be taken against possible spread of fire and the possible damaging effects to building and equipment from smoke and soot.

**J. TEMPORARY TOILETS**

The General Contractor shall provide and maintain in a sanitary manner, temporary toilets as necessary for the use of the workmen.

**K. PROJECT SIGN**

The General Contractor shall furnish and install a project sign and locate on site where directed by the Architect. The sign shall be 8 x 8 feet in size of 3/4" exterior grade plywood and supported and braced as needed. Paint all surfaces of sign with 2 coats of exterior house paint. Design and lettering shall be as detailed by the Architect.

**L. TESTS AND INSPECTIONS**

Unless otherwise noted, the General Contractor shall cause to be performed all inspections and tests required in each Section of the Specifications and those listed in Tables 1704.3, 1704.4 and 1704.5.1 of the Michigan Building Code. Notify each inspecting or testing authority or agency 24 hours in advance of each test or inspection required. Keep records of each test or inspection. Include in such records the time of the test or inspection, weather conditions, names of inspector or testing authority, results of the test and all other pertinent area. In addition to any other distribution, submit a copy of each report and test result as it is made to the Architect and the MSHDA representative for their review.

**M. LEAD BASED PAINT RENOVATION, REPAIR AND PAINTING PROCEDURE REQUIREMENTS**

1. Under the Residential Lead-based Hazard Reduction Act Of 1992, Congress required the EPA to develop regulations to address renovation, repair and painting (RRP) activities in single and multifamily housing built before 1978. The purpose of the new rule is to reduce children's exposure to dust containing lead paint created during the course of these activities. This rule is effective as of April 22,2010.
2. If any testing associated with any Renovation, Repair And Painting (RRP) activities is done, the results of that testing must be disclosed and available to any interested party.
3. Responsibility to comply with the new rule rests with contractor. Contractors and workers must be trained and certified by the EPA to conduct the new lead paint safe work practices while performing RRP activities in housing constructed prior to 1978.
4. Contractors shall be responsible for contacting occupants of dwelling units in writing prior to commencing work.
5. Exemptions: These rules may be waived under the following conditions:
  - a. The dwelling unit or facility was built after January 1, 1978.
  - b. The repairs are minor, with the interior work disturbing less than six sq. ft. or exteriors disturbing less than 20 sq. ft.
  - c. If the components of the dwelling unit test lead free by a Certified Risk Assessor, Lead Inspector, or Certified Renovator.

**N. VERMIN EXTERMINATION**

The General Contractor shall be responsible to contract for the extermination of all insects, rodents and other pests within each dwelling unit and common areas of the building prior to turning such building over to the Owner.

**O. GENERAL CONTRACTOR AND SUBCONTRACTOR INSURANCE**

The General Contractor and each subcontractor are required to purchase and maintain the following types of insurance:

1. Workman's Compensation
2. Public Liability Insurance with the following minimum coverage.
  - a. General Liability-\$1,000,000 per occurrence.
  - b. Bodily Injury-Minimum of \$1,000,000 per occurrence.
  - c. Property Damage-Minimum of \$1,000,000.
  - d. Include Contractual Liability coverage with same limits.
  - e. The Owner of the property shall be named as an additional insured.
3. Appropriate insurance certificates must be submitted prior to any payment requests.

**P. GUARANTEE PERIOD**

The General Contractor shall and hereby does guarantee and warrant that all work for this development, under this Contract, shall be free from defects or faulty labor and/or materials for a period of one (1) year from date of Substantial Completion of the project, except when longer periods are herein specified, which develop within any guarantee periods.

**Q. USE OF FACILITIES**

If the General Contractor or any of the Subcontractors or separate Contractors chooses to use any system, equipment, facilities or services which have been installed into the building as a permanent part thereof by any other Subcontractors or separate Contractor, such Contractor shall assume full responsibility for damage to said system, equipment, facilities or services, and shall make such arrangements with the installing Subcontractor as are necessary so that in no case shall the extent of the guarantee period mentioned above be jeopardized as a result of such use.

**END OF SECTION 01 10 00.06**

**SECTION 01 23 00 - ALTERNATES****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

**1.2 SUMMARY**

- A. Section includes administrative and procedural requirements for alternates.

**1.3 DEFINITIONS**

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

**1.4 PROCEDURES**

- A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
  - 1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
- B. Execute accepted alternates under the same conditions as other work of the Contract.

- C.    Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

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

**PART 3 - EXECUTION**

**3.1      SCHEDULE OF ALTERNATES**

- A.    Alternate No. 1 – Sections 07 31 00 PVC ROOFING / 07 54 23 – TPO Roofing
  - 1.    Provide pricing for both PVC and TPO roofing.

**END OF SECTION 01 23 00**

**SECTION 01 77 00 - CLOSEOUT PROCEDURES****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

**1.2 CLOSEOUT SUBMITTALS**

- A. Certificate of Insurance: For continuing coverage.
- B. Field Report: For pest control inspection.

**1.3 SUBSTANTIAL COMPLETION PROCEDURES**

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
  - 1. 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.
  - 2. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
  - 3. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number where applicable.
  - 4. Submit water and air test/adjust/balance records.

**1.4 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.

**1.5 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 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-inch paper.
  - 2. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
- 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.

**3.2 REPAIR OF THE WORK**

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

**END OF SECTION 01 77 00**

**SECTION 02 00 00 - DEMOLITION****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

**1.2 GENERAL**

The work of this Section consists of all demolition and cleaning, and related items, as shown on the drawings and as specified herein, and includes, but is not limited to, the following:

- A. All demolition work required for the existing buildings and existing site as called for on the drawings and/or as required to accommodate the renovation work. See Architectural, Civil, Landscape, Mechanical and Electrical sheets for demolition information.
  - 1. All demolition as called for on drawings and/or as required to complete the project.
  - 2. Demolition activities shall include the abatement of lead based paint and asbestos containing materials. The lead based paint abatement activities are to be done in accordance with Federal (Part 35) Regulations and Worker Safety Requirements under Part 603 of Public Act 154. The asbestos abatement must be done based upon an asbestos inspection meeting the requirements of NESHAP, by an appropriately licensed and insured abatement contractor.
  - 3. Cleaning of the site and building interiors to a broom finish.
  - 4. Demolition required by trades.
  - 5. Perform cutting of openings in floors for new installations.
  - 6. Patch and repair all holes left in walls, floors and ceilings as result of demolition operations.
  - 7. The above tasks shall be performed where deemed necessary regardless of their mention or non-mention on the drawings as directed by the Architect.
  - 8. Carry out all demolition work in close coordination and cooperation with structural trades for proper sequencing of the work to assure the complete safety and structural integrity of the building and its elements at all times. Provide temporary columns, jacks, beams, etc., where required for support of existing elements of construction to remain in safe, competent manner, in conformance with all laws, codes ordinances, rules and regulations bearing on the work.
  - 9. Cutting of holes through slabs and walls for new piping, wiring and general installations.

10. Cut all grooves, chases, openings, holes, etc., required for all trades and for the passage of piping, ductwork, conduit, etc., through existing construction except holes to be used for expansion or similar type anchoring devices which shall be cut by the trade requiring same.
11. Remove from site and legally dispose of all removed materials, trash, debris, etc., removed by demolition work, except any items specifically indicated on the drawings or specified herein to be reused on the project. Carefully remove items designated on drawings to be reused on the project, and provide safe storage of same in storage area(s) within the buildings, fully protected from damage.

### 1.3 RELATED WORK UNDER OTHER SECTIONS

- A. The following items of related work are specified and included in other sections of the Specifications:
  1. Patching of existing concrete.
  2. Cutting and capping of existing mechanical and electrical work as required in preparation for indicated demolition and removal of mechanical and electrical items.

### 1.4 EXAMINATION OF PREMISES

- A. The contractor will be held to have examined the premises before submitting his proposal for the work and to have satisfied himself as to the existing conditions under which he will be obligated to operate or that will in any way affect the work under this Contract, and also the amount of existing materials and debris to be removed, the amount of cleaning to be done and the amount of specific surface preparation to be done. No allowances will be made in this connection for error or negligence of the Contractor.
- B. Areas of the building are dangerous and have collapsed. Cordon off areas that are not suitable normal demolition work. Stabilize these areas to be reconstructed to make them safe for work to proceed.

### 1.5 MANNER OF CONDUCTING THE WORK

- A. The work shall be conducted with prime consideration given to the following:
  1. Compliance with all applicable laws, codes, ordinances, and regulations, including O.S.H.A.
  2. Protection of the public and workmen.
  3. Protection from the weather.
  4. No bearing walls or structural members shall be removed without contacting the Architect in writing and receiving his written consent.

5. Carry out all demolition work in close coordination and cooperation with structural trades for proper sequencing of the work to assure the complete safety and structural integrity of the building and its elements at all times. Provide temporary columns, jacks, beams, etc., where required for support of existing elements of construction to remain in safe, competent manner, in conformance with all laws, codes ordinances, rules, and regulations bearing on the work.
  6. Elimination of noise, shocks and vibration.
  7. Elimination of dirt and dust.
  8. Orderly access to, and storage of materials.
  9. Protection of the existing building from damage of all types from all sources.
  10. Discipline and order of construction personnel.
  11. Neat and accurate cutting and trimming of elements to be only partially removed, subject to Owner's approval.
- B. Demolition of all portions of the structure to be removed shall be done with utmost care, using tools and methods subject to Owner's approval. All possible care shall be taken to avoid damaging, shock or vibration to portions of existing structure to remain.
- C. Debris shall not be allowed to accumulate and shall be sprinkled during handling and loading to reduce dust. All debris shall be removed from the premises daily.
- D. Post "NO SMOKING" signs in all interior spaces where demolition work is to be carried on. Strictly enforce the "NO SMOKING" restriction among all personnel employed on the work.
- E. Construct temporary dust proof enclosures to contain dust to areas of demolition. Coordinate locations with General Contractor.

## 1.6 CLEANING

- A. Upon completion of demolition work, remove all loose dust, and debris and broom clean all exposed surfaces throughout.

## PART 2 - PRODUCTS - NOT USED

## PART 3 - EXECUTION- NOT USED

END OF SECTION 02 00 00

## SECTION 03 30 00 – CONCRETE

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 GENERAL

- A. Items included but not limited to the following:
  - 1. Footings and foundations
  - 2. Furnishing and installation of reinforcing steel material and welded wire fabric.
  - 3. Furnishing and installation of all necessary accessories.
  - 4. Site concrete
  - 5. Sub-base
  - 6. Formwork
  - 7. Mechanical and electrical bases (refer also to specific Divisions of these specifications).
  - 8. Testing

## 1.3 SITE CONCRETE

- A. Materials - Concrete shall conform to Section 2.1, Cast-in-place concrete.
- B. Execution
  - 1. Concrete work shall be as indicated on the drawings.
  - 2. All concrete walks shall be of size indicated on the drawings. Concrete walks shall have tooled joints spaced equal to the walk width but not more than five feet with expansion joints located at each fourth joint. Concrete shall have a light broom finish across the width.
  - 3. Patios, porches, waiting areas and steps shall be as indicated on the drawings. All exterior concrete to have light broom finish.
  - 4. Exterior walks and slabs shall be installed over a minimum of 4" of compacted bank run sand or gravel. Subbase below granular fill shall be well compacted before fill is placed.

5. Set curb forms with top at finished grade. Provide grade stakes not more than 20 feet apart for all curb construction. Check tops of forms for grade before placing concrete and reinforcing.
  6. Construct concrete curbs in sections 20 feet long. Install 1/4" premolded filler plates between each section. Such plates shall be of size and shape conforming to cross-section of the concrete. Minimum length of closure piece to be 4 inches.
  7. Rub face of concrete curb where necessary.
  8. Coordinate locations and dimensions of mechanical and electrical bases with respective subcontractors and the General Contractor.
  9. Refer to the Civil drawings for detectable warning information.
- C. All other requirements for site concrete not covered above shall be as per Section 2.1, CAST-IN-PLACE CONCRETE.

## PART 2 - PRODUCTS

### 2.1 MATERIALS - CAST-IN-PLACE CONCRETE

- A. Concrete work shall conform to all requirements of ACI 301 Specifications for Structural Concrete for Buildings, except as modified by the Supplemental Requirements below. The Contractor shall keep a copy of the "Field Reference Manual" (ACI-SP-15) containing these specifications and related reference material in the project field office at all times. (Can be obtained from American Concrete Institute, P.O. Box 19150, Detroit, MI 48219-0150).
- B. The following items are additions, changes, or omissions to those specifications and govern over them. Items are numbered according to related chapters and paragraph number of ACI-301.

#### MATERIALS FOR CONCRETE

- 2.1 Type I, II or III (ASTM C150) cements may be used.

## PROPORTIONING

- 3.2 All concrete for interior work and footings shall have a minimum compressive strength of 3000 PSI at 28 days.

Concrete for exterior work shall have a minimum compressive strength of 4000 PSI at 28 days and shall contain entrained air per table 3.4.1.

- 3.4.1 Concrete exposed to the weather shall contain entrained air as per table 3.4.1. The maximum water cement ratio shall be 5-1/2 gallons of water per sack of cement, for concrete exposed to the weather.

- 3.7.1 No admixture containing calcium chloride shall be used without written permission from the Architect.

- 3.8 The proportioning of concrete mixes shall be in accordance with Method 1 or Method 2. A minimum cement content of 5 sacks per yard is to be used.

## FORMWORK

- 4.1.3 Earth cuts may be used as forms for vertical surfaces providing the sides of the cuts are stable enough to contain the concrete without contamination.

## REINFORCEMENT

- 5.2.1 Reinforcing steel except for ties and stirrups shall be new billet stock conforming to ASTM A-615 Grade 60. Reinforcing steel for ties and stirrups shall conform to ASTM A-615 Grade 60.

Concrete slabs on grade shall have fiber mesh reinforcement or 6"x6" W1.4 x W1.4 welded wire mesh. Place mesh reinforcement in the top 1/3 of the slab, with mesh lapped and wired together at its joints.

## JOINTS AND EMBEDDED ITEMS

- 5.1.2 Longitudinal keys may be omitted at the construction joints between walls and slabs or footings providing the surface of the concrete is thoroughly cleaned and all laitance removed.

Install 5/8" diameter by 12" long stainless steel threaded anchor bolts spaced 32" on center for attachment of sill plates at exterior walls.

- 6.4 Bolts, nuts, and washers as per "Specifications for low-carbon steel externally and internally threaded standard fasteners" (ASTM A-307).

Structural Steel - Structural steel inserts per ASTM A-36.

Various other inserts - the Dayton Sure Grip and Shore Co. Products, 721 Richard Street, Miamisburg, Ohio 45342; Heckman Building Products, Inc., 4018 West Lake Street, Chicago, IL 60624.

If any of these inserts are to be exposed to the elements after completion of the construction, they are to be galvanized as per ASTM A-153.

#### PLACING

- 8.1 Placing of concrete shall not be started until the Owner or his representative reviews the reinforcing, embedded items and openings. Adequate notice shall be given for this review. This does not relieve the Contractor of his responsibilities.

#### FINISHING OF FORMED SURFACES

- 10.2.2 All interior exposed concrete surfaces shall receive smooth form finish. All exposed exterior concrete surface shall receive a medium broom finish.
- 10.3 Required rubbed finish shall be as per 11.3.2 Grout cleaned finish.

#### SLABS

- 11.7 Unless otherwise noted, floors are to receive a trowel finish.

#### TESTING - BY THE GENERAL CONTRACTOR

- 16.2 An independent testing laboratory approved by the Architect shall provide for the services of Sections 16.3 and 16.4 for all concrete. The General Contractor shall pay for these services.
- 16.3 Three (3) test specimens shall be made for each test. One specimen shall be tested at 7 days, and two at 28 days. The General Contractor shall provide field storage facilities for storing test cylinders as per ASTM C31-69 prior to being taken to the laboratory. The testing laboratory is responsible for proper handling, and delivery to the laboratory of the cylinders. The testing laboratory shall prepare all test specimens. One set of test specimens shall be made for each one hundred (100) cubic yards or fraction thereof of a given concrete mix placed in any one day.

- 16.6 Two (2) copies of all concrete tests shall be submitted to the Contractor. One copy shall be sent directly to the Architect, the Owner and the MSHDA representative by the testing laboratory.

#### TESTING - BY THE SUBCONTRACTORS

- 16.2 The subcontractors shall provide and pay for the service under Sections 16.5 and 16.7.
- 16.7 The subcontractor shall, at the time a contract is awarded to him, submit the design mixes to the Owner two weeks or more before the work is begun; no work will be placed prior to written approval of mixes.

#### TESTING OF CONCRETE IN PLACE

- 17.3 Core tests as in 17.3.2 of ACI-301 and/or Windsor Probe system are allowed methods of testing concrete in place.

## 2.2 OTHER MATERIALS

- A. This pertains to material other than those cast into the concrete.
- B. Fill Under Slabs on Grade and Site Concrete - Material shall be bank run sand or gravel or crushed stone. Thickness shall be a minimum of 4". Submit samples for approval by the General Contractor.
- C. Expansion Joint Filler - Material as required shall be 1/2" thick pre-molded asphalt impregnated fiber-board, width as required, unless otherwise shown on plan.
- D. Rigid Perimeter Insulation – 2" thick by 48" wide horizontally, 24" wide vertically by length of standard sizes to facilitate work, extruded polystyrene material, R-10. See drawings for areas to receive perimeter insulation. Insulation shall be manufactured specifically for below grade use.
- E. Vapor Barrier – Interior slabs on grade shall have a minimum of 15 mil. Stego vapor barrier placed between the porous fill and the slab.

**PART 3 - EXECUTION****3.1 INSTALLATION**

- A. Perimeter Insulation – Place below slab-on-grade, tight to foundation walls, 48” horizontally and 24” vertically.
- B. Vapor Barrier – the membrane under the slab on grade shall be lapped and sealed per the manufacturers written instructions. Anchor the vapor barrier securely in place during placing of fill and concrete.
- C. Patching formed concrete: Remove projections and offsets, cut out defects to sound concrete edges to be cut straight and back-beveled. Dampen cuts and scrub with a neat Portland cement slurry just prior to patching. Fill voids and patches with flush smooth finished concrete mortar mix (less coarse aggregate), cure and dry.
- D. Cold Weather Requirements
  - 1. Cold weather requirements per ACI standard 306-66 and as required herein.
  - 2. Adequate equipment, housings and covering shall be provided for heating concrete materials and concrete during freezing and near freezing temperatures. No frozen materials or materials containing ice shall be used.
  - 3. All concrete materials, reinforcement, forms, fillers and the ground on which concrete is to be placed shall be free of frost, snow and ice. Provide adequate means of maintaining temperature of 45 degrees F. to 85 degrees F. for at least 4 days after concrete placement. Protective covering shall remain in place for at least 24 hours after artificial heat is discontinued.
  - 4. Methods and the extent of protection shall meet with the approval of the Owner.
  - 5. Any concrete damaged by frost, freezing or pouring on frozen ground shall be replaced at no cost to the Owner.
  - 6. Cold weather requirements will be enforced whenever surrounding air temperatures fall below 40 degrees F.
- C. Hot Weather Requirements
  - 1. Hot weather requirements shall be per ACI standard 305-72 and as required herein.

2. Temperature of concrete shall not exceed 90 degrees F.
3. The design water/cement ratio shall not be exceeded.
4. Retarding admixtures and curing procedures shall be as recommended by the Structural Engineer.

**END OF SECTION 03 30 00**

**SECTION 04 01 20 – UNIT MASONRY & STONE CLEANING****PART 1 - GENERAL****1.1 SUMMARY**

- A. This section includes cleaning of existing masonry & stone as follows:
  - 1. Cleaning exposed, existing masonry & stone] surfaces.
  - 2. Protection of existing structure during cleaning operations.

**1.2 DEFINITIONS**

- A. Masonry Cleaning: This Specification describes a cleaning system designed to effectively clean and restore the existing exterior masonry surfaces. The system combines the application of a specific restorative cleaner with efficient rinsing pressure.
- B. Rinsing-Pressure Spray: 400 to 1000 psi; 6 to 8 gpm.
- C. Low-Pressure Spray: 100 to 400 psi; 4 to 6 gpm.

**1.3 SUBMITTALS**

- A. General: Submit the following according to the Conditions of the Contract and Division 01 General Requirements specification sections.
- B. Product data for each product indicated including recommendations for their application and use. Include test reports and certifications substantiating that products comply with requirements.
- C. Material certificates for the following signed by manufacturer and Contractor certifying that each material complies with requirements.
  - 1. Each type of chemical cleaning material.
- D. Qualification data for firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include list of completed projects with project names, addresses, telephone numbers, names of Architects and Owners, and other information specified.

- E. Restoration program: For each phase of the restoration process, including protection of surrounding materials on building and site during operations. Describe in detail the materials, methods, and equipment to be used for each phase of the restoration work.
  - 1. If alternative methods and materials to those indicated are proposed for any phase of restoration work, provide a written description, including evidence of successful use on other comparable projects, and a testing program to demonstrate their effectiveness for this Project.
- F. Cleaning Program: Describe cleaning process in detail; protection of surrounding materials on building and site; and control of runoff during operations. Describe in detail the materials, methods and equipment to be used.
  - 1. If alternative methods and materials to those indicated are proposed for any phase of cleaning work, provide a written description, including evidence of successful use on other comparable projects, and a testing program to demonstrate their effectiveness for this Project.
- G. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements.

#### 1.4 QUALITY ASSURANCE

- A. Restoration Specialist: Engage an experienced masonry restoration and cleaning firm that has specialized in the types of work required for this Project for a minimum of five (5) years. At Contractor's option, the work may be divided between two specialist firms: one for cleaning work and one for repair work.
  - 1. Field Supervision: Require restoration specialist firm to maintain an experienced full-time supervisor on the job site during times that stone masonry restoration and cleaning are in progress.
  - 2. Restoration Worker Qualifications: Persons who are experienced in restoration work of types they will be performing. When stone units are being patched, assign at least one worker among those performing patching work who is trained and certified by manufacturer of patching compound to apply its products.
- B. Chemical Manufacturer Qualifications: A company regularly engaged in producing masonry cleaning compounds, which have been used on similar projects with successful results, and that retains factory-trained representatives who are available for consultation and job site inspection and assistance at no additional cost.
- C. Source of Materials: Obtain materials for masonry restoration from a single source for each type material required (stone, cement, sand, etc.) to ensure a match of quality, color, pattern, and texture.

**D. Field-Constructed Mockups:**

1. Schedule a Pre-Mockup conference to review brick and mortar removal and replacement procedures with the Owner's Representative.
2. Restoration Mockup: Prior to starting general masonry restoration, Prepare mockups on existing walls under same weather conditions to be expected during remainder of the Work. Prepare mockups using same materials, equipment, and methods proposed for the Work. Obtain Owner's Representative approval of visual qualities before proceeding with the balance of the masonry restoration.
  - a. Notify Owner one week in advance of dates and times when samples will be prepared. Manufacturer's representative of cleaning materials to be present during testing.
  - b. Masonry Cleaning: Demonstrate the materials and methods to be used for cleaning each type of masonry surface and condition on sample location approximately 25 sq. ft. in area.
    - 1) Test materials and methods on samples of adjacent non-masonry materials for possible reaction with cleaning materials, except where materials and methods are known to have a deleterious effect on such materials.
    - 2) Allow a waiting period of the duration indicated, but not less than 3 calendar days, after completion of sample cleaning to permit a study of sample panels for negative reactions.
  - c. Retain acceptable panels in an undisturbed condition, suitably marked, during construction as a standard for judging the completed Work. Areas may remain as part of the completed work.
  - d. Approval of sample panels is for degree of cleaning; relationship of mortar and sealant colors to masonry unit colors; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by the Architect in writing.
3. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels, unless such deviations are specifically approved by the Owners Representative in writing.

**1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver masonry materials to Project in undamaged condition.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

## 1.6 PROJECT CONDITIONS

- A. Clean masonry surfaces only when air temperature is 40 deg F and above and will remain so until masonry has thawed and dried out, but for not less than 7 days after completion of cleaning.
  - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until masonry has thawed and dried out, but not less than 7 days after completion of cleaning.
  - 2. Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from masonry. Provide artificial shade and wind breaks and use cooled materials as required.
    - a. Refer to chemical cleaner manufacturer's recommendations for application techniques when application hot-weather conditions exist.

## 1.7 SEQUENCING AND SCHEDULING

- A. Order replacement materials at earliest possible date, to avoid delaying completion of the Work.
- B. Perform restoration work in the following sequence:
  - 1. Remove plant growth, if any.
  - 2. Inspect for open mortar joints and repair before cleaning to prevent intrusion of water and other cleaning materials into the wall.
  - 3. Clean masonry surfaces.
  - 4. Apply water repellent coating.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. Substitutions: As approves by Owners Representative and Architect.

### 2.2 CLEANING MATERIALS AND EQUIPMENT

- A. Water for Cleaning: Clean, potable, free of oils, acids, alkalis, salts, and organic matter.

- B. Biological Soiling Remover: Manufacturer's standard cleaner designed to remove mold, mildew, and atmospheric staining from masonry.
  - 1. Approved Products:
    - a. "[Enviro Klean ReVive](#)": PROSOCO, Inc. (800-255-4255) (Basis of Design).
- C. Nonabrasive Brushes: Fiber bristles only.
- D. Spray Equipment: Provide equipment for controlled spray application of water and chemical cleaners, if any, at rates indicated for pressure, measured at spray tip, and for volume. Adjust pressure and volume, as required, to ensure that damage to masonry does not result from cleaning methods.
  - 1. For chemical cleaner spray application, provide a low-pressure tank or chemical pump suitable for the chemical cleaner indicated, equipped with a cone-shaped spray tip.

## 2.3 CHEMICAL CLEANING SOLUTIONS

- A. General: Unless otherwise indicated, dilute chemical cleaning materials with water to produce solutions of concentration indicated but not greater than that recommended by chemical cleaner manufacturer.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

### 3.2 PREPARATION

- A. General: Comply with the chemical cleaner manufacturer's recommendations for protecting adjacent building surfaces against damage from exposure to their products.
  - 1. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Protect persons, motor vehicles, surrounding surfaces of building whose masonry surfaces are being restored, building site, plants, and surrounding buildings from injury resulting from masonry restoration work.

1. Comply with chemical cleaner manufacturer's and Owner's written instructions for protecting building and other surfaces against damage from exposure to its products. Prevent chemical cleaning solutions from coming into contact with pedestrians, motor vehicles, landscaping, buildings, and other surfaces that could be injured by such contact.
  2. Cover adjacent surfaces with materials that are proven to resist chemical cleaners used unless chemical cleaners being used will not damage adjacent surfaces. Use materials that contain only waterproof, UV-resistant adhesives. Apply masking agents to comply with manufacturer's written instructions. Do not apply liquid masking agent to painted or porous surfaces. When no longer needed, promptly remove masking to prevent adhesive staining.
  3. Keep wall wet below area being cleaned to prevent streaking from runoff.
  4. Do not clean masonry during winds of sufficient force to spread cleaning solutions to unprotected surfaces.
  5. Dispose of runoff from cleaning operations by legal means and in a manner that prevents soil erosion, undermining of paving and foundations, damage to landscaping, and water penetration into building interiors.
  6. Erect temporary protection covers over pedestrian walkways and at points of entrance and exit for persons and vehicles that must remain in operation during course of masonry restoration work.
- C. Protect adjacent surfaces from contact with chemical cleaners by covering them with a liquid strippable masking agent or polyethylene film and waterproof masking tape. Apply masking agent to comply with manufacturer's recommendations. Do not apply liquid masking agent to painted or porous surfaces.
1. Contractor must provide detailed information on materials and method plan to be used on these surfaces, prior to beginning of work, and as approved by A/E.
- D. Masonry surfaces that are not to be cleaned shall be protected from contact with the cleaning solution with sheets of polyethylene or other proven protective materials, firmly fixed and sealed to the surface. Non-masonry surfaces that are not protected shall be kept running-wet with clean water throughout the cleaning process of adjacent stone.
1. Contractor must provide detailed information on materials and method plan to be used on these surfaces, prior to beginning of work, and as approved by A/E.
- E. All surfaces not to be cleaned shall be tested for possible detrimental effect of the cleaning solutions and protected as determined necessary by test results.
- F. All open joints shall be temporarily caulked or otherwise protected to prevent intrusion of washing waters into the wall structure or building interior. Build up waterproof dams to divert flowing water to exterior.

### 3.3 UNUSED ANCHOR REMOVAL

- A. Remove masonry anchors, brackets, wood nailers, and other extraneous items no longer in use unless identified as historically significant or indicated to remain.
  - 1. If item cannot be removed without damaging surrounding masonry, replace masonry unit.

### 3.4 BIOLOGICAL SOILING REMOVER

- A. Proceed with cleaning of biological soiling if specified mild cleaner was tested and ineffective to blackened area. Apply in an orderly manner; work from bottom to top.
- B. Use only those cleaning methods indicated for each masonry material and location in strict accordance with manufacturer's written instructions.
  - 1. Scrub surface with nonabrasive brush or synthetic scrubbing pad. Do not use wire brushes.
  - 2. Use spray equipment that provides controlled application at volume and pressure indicated, measured at spray tip.
  - 3. For water spray application, use fan-shaped spray tip that disperses water at an angle of 15 to 45 degrees.
- C. Application Methods:
  - 1. Dilute chemical cleaner based on testing and manufacturer's published recommendations.
  - 2. Apply diluted chemical cleaner to dry masonry surfaces. Comply with chemical cleaner manufacturer's written instructions until surface is thoroughly wet; use brush or spray application methods, at Contractor's option.
  - 3. Do not spray apply at pressures exceeding 50 psi.
  - 4. Let chemical cleaner dwell for 2 to 3 minutes. Reapply the cleaner to keep surface wet for allotted time period.
  - 5. Mist treated surface with water and gently scrub with non-metallic, short-fibered scrub brush to loosen biological soiling.
  - 6. Rinse thoroughly with clean water from bottom to the top.
  - 7. Reapply, if necessary to achieve specified results. It may take several days for the full cleaning effect to be realized. When practical, allow two or more weeks for biological soiling to disappear.

### 3.5 PROTECTION

- A. Provide final protection and maintain conditions in a manner acceptable to Installer, which ensures unit masonry work being without damage and deterioration at time of substantial completion.
- B. Correct damage by cleaning, repairing or replacing, and repainting, as approved by A/E.

**END OF SECTION 04 01 20**

**SECTION 04 01 20.63 – MASONRY REPAIR****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes the following work:
  - 1. Repairing brick and stone masonry, including removing, replacing, and/or patching masonry units where new openings are installed and existing steel lintels are replaced.
  - 2. Repairing brick or stone in the event that brick or stone is damaged.
- B. It is not the purpose of this specification to replace brick or stone which has only minor damage.

**1.2 QUALITY ASSURANCE**

- A. Brick Masonry Repair Specialist Qualifications: Engage an experienced brick masonry repair firm to perform work of this Section. Firm shall have completed work similar in material, design, and extent to that indicated for this Project with a record of successful in-service performance. Experience in only installing masonry is insufficient experience for masonry repair work.
  - 1. Field Supervision: Restoration specialist firms shall maintain experienced full-time supervisors on Project site during times that clay masonry restoration and cleaning work is in progress.
  - 2. Restoration Worker Qualifications: Persons who are experienced in restoration work of types they will be performing, minimum of 2 years. When brick or stone is being patched, assign at least one worker among those performing patching work who is trained and certified by manufacturer of patching compound to apply its products.
- B. Quality-Control Program: Prepare a written quality-control program for this Project to systematically demonstrate the ability of personnel to properly follow methods and use materials and tools without damaging masonry. Include provisions for supervising performance and preventing damage.
- C. Mockups: Prepare mockups of brick masonry repair to demonstrate aesthetic effects and to set quality standards for materials and execution and for fabrication and installation.

1. Mockups shall be performed by the Contractor of this Section, location chosen by the Architect.
2. Masonry Repair: Prepare sample areas for each type of masonry repair work performed. If not otherwise indicated, size each mockup not smaller than two adjacent whole units or approximately 48 inches in least dimension. Construct sample areas in locations in existing walls where directed by Architect unless otherwise indicated. Demonstrate quality of materials, workmanship, and blending with existing work. Include the following as a minimum:
  - a. Removal and replacement of brick:
    - 1) at location of new steel lintel.
    - 2) One deteriorated brick unit in a field of sound masonry.
  - b. Patching, in the event that brick/stone is damaged during construction, three (3) small holes at least 1 inch (25mm) in diameter for each type of masonry material required to be patched, so as to leave no evidence of repair.
3. Obtain Architect's approval of mockups before starting the remainder of masonry restoration.
4. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed work.

D. Environmental Conditions:

1. All masonry restoration work including cleaning and masonry repair shall be performed only when air temperature is between 40 and 90 degrees F and is predicted to remain so for at least 7 days after completion of work. Retain, on site, a log of surface and ambient temperatures.
2. When temperature is below requirements, operations shall be conducted on a day to day basis when authorized by the Architect. Proceed only when the Contractor is willing to guarantee the work as required and without additional reservations and restrictions.
3. Do not mix or apply mortar to outside surfaces during rain or when surfaces contain standing water.
4. Protect masonry from freezing for 3 days or until mortar is thoroughly dry and hardened.
5. Cold weather requirements:
  - a. Cold weather, as referred to in this Section, is four hours with ambient temperatures below 40 degrees F in a 24 hour period. Do not lay masonry in cold weather unless authorized by Architect.
  - b. Heat mixing water and sand as required during cold weather to produce mortar temperatures at application of between 70 and 120 degrees F.

- c. Heat masonry units to 40 degrees F minimum when ambient temperature is below 20 degrees F.
- d. Provide windbreaks during construction if ambient temperature is 35 degrees F or below and wind velocities exceed 15 mph.
- e. If ambient temperatures are 20 degrees F or below, provide enclosure for masonry under construction with heat sources and maintain temperature in enclosure at 40 degrees F min. during work and for 7 days after work is complete.
- f. Keep materials free of ice and snow. Do not lay masonry on frozen material.

E. Mortar: Refer to Specifications Section 04 01 20.64 Brick Masonry Repointing.

### 1.3 SEQUENCING AND SCHEDULING:

- A. Perform brick and stone restoration work in the following sequence:
  1. Survey, document and understand existing conditions prior to starting work.
  2. Produce test panels and mockups as specified.
  3. Clean exterior masonry.
  4. Repair existing brickwork and stonework, including replacing severely damaged units and where new steel lintels and openings are installed.
  5. Rake out existing mortar from joints indicated to be repointed.
  6. Point existing mortar joints of brick or stone indicated to be restored.

## PART 2 - PRODUCTS

### 2.1 MASONRY MATERIALS

- A. Face Brick: As required to complete brick masonry repair work.
  1. Brick Matching Existing: Units with colors, color variation within units, surface texture, size, and shape that match existing brickwork.
    - a. Physical Properties: According to ASTM C 67.
    - b. For existing brickwork that exhibits a range of colors or color variation within units, provide brick that proportionally matches that range and variation rather than brick that matches an individual color within that range.

2. Special Shapes:
  - a. Provide molded, 100 percent solid shapes for applications where core holes or "frogs" could be exposed to view or weather when in final position and where shapes produced by sawing would result in sawed surfaces being exposed to view.
  - b. Provide specially ground units, shaped to match patterns, for arches and where indicated.
  - c. Mechanical chopping or breaking brick, or bonding pieces of brick together by adhesive, are unacceptable procedures for fabricating special shapes.
  - d. Building Brick: ASTM C 62, Grade SW where in contact with earth or Grade SW for concealed backup; and of same vertical dimension as face brick, for masonry work concealed from view.
- B. Salvaged Brick: Approved by the Architect, sound, crack free, clean brick without face chips larger than 1/2", salvaged from face brick work on other parts of the building. Individual damaged brick can often be repaired by removing the brick and turning it around so that the undamaged face is exposed.
- C. Stone: Provide natural building stone units of type, color, surface texture, compressive strength, permeability, size and profile to match existing stone units from the building.

## 2.2 MANUFACTURED REPAIR MATERIALS

- A. Brick or Stone Patching Compound: Factory-mixed cementitious product that is custom manufactured for patching brick masonry.
  1. Basis of Design Product: Subject to compliance with requirements, provide Cathedral Stone Products, Inc.; Jahn Restoration Mortars, or a comparable product by one of the following:
    - a. Edison Coatings, Inc.; Custom System 45
    - b. Equal product by other manufacturer must be approved by Architect prior to receipt of bids.
  2. Use formulation that is vapor- and water permeable (equal to or more than the masonry unit), exhibits low shrinkage, has lower modulus of elasticity than the masonry units being repaired, and develops high bond strength to all types of masonry.
  3. Formulate patching compound in colors and textures to match each masonry unit being patched.

- B. Injection and Repair Grout:
  - 1. Basis of Design Product: Subject to compliance with requirements, provide Cathedral Stone Products; Jahn; M30 Micro Injection Grout and M40 Crack and Void Injection Grout, or a comparable product by one of the following:
    - a. Edison Coatings, Inc.
    - b. Equal product by other manufacturer must be approved by Architect prior to receipt of bids.
  
- C. Stone-to-Stone Adhesive: 1-part cementitious stone adhesive, recommended by adhesive manufacturer for type of stone repair indicated, and matching stone color.
  - 1. Basis of Design Product: Subject to compliance with requirements provide Cathedral Stone Products, Inc.; Jahn Restoration Adhesive, or comparable product by one of the following:
    - a. Equal product by other manufacturer must be approved by Architect prior to receipt of bids.

### 2.3 ACCESSORY MATERIALS

- A. Setting Buttons and Shims: Resilient plastic, nonstaining to masonry, sized to suit joint thicknesses and bed depths of masonry units, less the required depth of pointing materials unless removed before pointing.
  
- B. Natural bristle brushes
  
- C. Wooden scrapers (no metal)
  
- D. Liquid Strippable Masking Agent: Manufacturer's standard liquid film forming, strippable masking material for protecting glass, metal and polished stone surfaces from damage.
  
- E. Stone Anchors: Accessories, dowels, clamps, straps, bars, and rods shall be type 302 or 304 F. Other Products: Select materials and methods of use based on the following, subject to approval of a mockup:
  - 1. Previous effectiveness in performing the work involved.
  - 2. Minimal possibility of damaging exposed surfaces.
  - 3. Consistency of each application.
  - 4. Uniformity of the resulting overall appearance.
  - 5. Do not use products or tools that could leave residue on surfaces.

## 2.4 MORTAR MIXES

- A. Mason shall engage an independent testing laboratory to analyze existing mortar for composition and strength. Have both the mortar on the front brick and the rear brick analyzed. Mortar for repair and tuckpointing to be done with mortar matching the original. Provide laboratory analysis to Architect for review and approval.

## 2.5 CLEANING MATERIALS

- A. Refer to Specifications Section 04 01 10 Masonry Cleaning.

# PART 3 - EXECUTION

## 3.1 PROTECTION

- A. Protect persons, motor vehicles, surrounding surfaces of building being restored, building site, plants, and surrounding buildings from harm resulting from masonry restoration work.
- B. Extreme care must be taken not to cause stains, blemishes, or damage to adjacent material. Any damage shall be repaired or replaced by this Contractor at no addition cost to the Owner.

## 3.2 BRICK AND STONE REMOVAL AND REPLACEMENT

- A. At locations indicated, remove bricks that are deteriorated or damaged beyond repair and at new openings in masonry. Carefully remove entire units from joint to joint, without damaging surrounding masonry, in a manner that permits replacement with full-size units.
- B. Remove masonry as required to install steel lintels. Once lintel install is completed, replace masonry with salvaged units.
- C. Support and protect remaining masonry that surrounds removal area.
- D. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition.

- E. Notify Architect of unforeseen detrimental conditions including voids, cracks, bulges, and loose units in existing masonry backup, rotted wood, rusted metal, and other deteriorated items.
- F. Remove in an undamaged condition as many whole bricks as possible.
  - 1. Remove mortar, loose particles, and soil from brick by cleaning with hand chisels, brushes, and water.
  - 2. Remove sealants by cutting close to brick with utility knife and cleaning with solvents. stainless steel.
- G. Clean masonry surrounding removal areas by removing mortar, dust, and loose particles in preparation for brick replacement.
- H. Replace removed damaged brick with other removed brick in good condition, where possible, matching existing brick. Do not use broken units unless they can be cut to usable size.
- I. Install replacement brick into bonding and coursing pattern of existing brick. If cutting is required, use a motor-driven saw designed to cut masonry with clean, sharp, unchipped edges.
  - 1. Maintain joint width for replacement units to match existing joints.
  - 2. Use setting buttons or shims to set units accurately spaced with uniform joints.
- J. Lay replacement brick with rebuilding (setting) mortar and with completely filled bed, head, and collar joints. Butter ends with enough mortar to fill head joints and shove into place. Wet both replacement and surrounding bricks that have ASTM C 67 initial rates of absorption (suction) of more than 30 g/30 sq. in. per min. Use wetting methods that ensure that units are nearly saturated but surface is dry when laid.
  - 1. Tool exposed mortar joints in repaired areas to match joints of surrounding existing brickwork.
  - 2. Rake out mortar used for laying brick before mortar sets according to Specifications. Point at same time as repointing of surrounding area.
  - 3. When mortar is hard enough to support units, remove shims and other devices interfering with pointing of joints.

### 3.3 MASONRY UNIT PATCHING

- A. Masonry Unit Patching applies in the event that brick/stone is damaged during construction.

- B. Small Chips and Losses (pitting): Minor losses which do not pond water, compromise the brick/stone's structural integrity, or grossly disfigure the brick/stone, do not require patching.
- C. Medium Chips and Losses: Use patching compound designed for restoration of brick/natural stone. Prepare brick and stone and apply patch according to manufacturer instructions.
- D. Large Chips and Losses: Use a Dutchman. Areas to receive Dutchman are those with at least two exposed surfaces (corners). If possible use salvaged stone from the building.
1. Cut out a neat, rectangular prism in the original stone with a diamond saw. Work the inside corners by hand. Saw the Dutchman repair piece precisely to fit into the prepared hole.
  2. Install with mortar and/or epoxy as specified.
- E. Only at the coping stones, do not patch chips and losses that occur and/or extend less than 2 inches below the top of the stone.
- F. Patching Bricks or Stone:
1. Remove loose material from masonry surface. Carefully remove additional material so patch does not have feathered edges but has square or slightly undercut edges on area to be patched and is at least 1/4 inch thick, but not less than recommended in writing by patching compound manufacturer.
  2. Mask adjacent mortar joint or rake out for repointing if patch extends to edge of masonry unit.
  3. Mix patching compound in individual batches to match each unit being patched. Combine one or more colors of patching compound, as needed, to produce exact match.
  4. Rinse surface to be patched and leave damp, but without standing water.
  5. Brush-coat surfaces with slurry coat of patching compound according to manufacturer's written instructions.
  6. Place patching compound in layers as recommended in writing by patching compound manufacturer, but not less than 1/4 inch or more than 2 inches thick. Roughen surface of each layer to provide a key for next layer.
  7. Trowel, scrape, or carve surface of patch to match texture and surrounding surface plane or contour of masonry unit. Shape and finish surface before or after curing, as determined by testing, to best match existing masonry unit.
  8. Keep each layer damp for 72 hours or until patching compound has set.

### 3.4 REPAIR OF CRACKED OR FRACTURED MASONRY

- A. Repair of cracked or fractured masonry applies in the event that brick/stone is damaged during construction.
- B. Clean joint and cracks immediately before installation of grout mixture. Remove dirt, mortar, caulking, insecure coatings and other substances which will interfere with bond.
- C. Partial fractures and fine cracks (up to 9/16"): Fractures that do not extend through a unit are repaired with grout applied by pressure injection. For small cracks, a 60mm syringe can be used, 12 oz single-use syringe used by veterinarians.
- D. Crack Repair:
  - 1. Fine cracks up to 3/16"; use Jahn M30, formulation #31 or #32 as required.
  - 2. Medium sized cracks between 3/16" and 9/16"; use Jahn 40.
  - 3. Through cracks and large cracks, wider than 9/16"; remove units and replace.
  - 4. Comply with all manufacturer's instructions and recommendations.
  - 5. Do not allow compounds to overflow, migrate, or spill on exposed surfaces. Use masking tape or other precautionary devices to prevent staining.

### 3.5 TUCKPOINTING

- A. Masonry Tuckpointing - Cut out existing mortar joints (both bed and head joints) and remove by means of a toothing chisel or a special pointer's grinder, to a uniform depth of 19 mm (3/4-inch), or until sound mortar is reached. Take care to not damage edges of existing masonry units to remain.
- B. Stone Restoration – Cut out all existing cement mortar joints as far back as required to reach the original mortar. Take care with toothing chisels and power equipment to not damage limestone pieces to remain.
- C. Remove dust and debris from the joints by brushing, blowing with air or rinsing with water. Do not rinse when temperature is below freezing.

### 3.6 JOB CONDITIONS

- A. Protection: Protect newly pointed joints from rain, until pointed joints are sufficiently hard enough to prevent damage.
- B. Cold Weather Protection:
  - 1. Tuck pointing may be performed in freezing weather when methods of protection are utilized.
  - 2. Comply with applicable sections of "Recommended Practices for Cold Weather Construction" as published by International Masonry Industry All Weather Council.
  - 3. Existing surfaces at temperatures to prevent mortar from freezing or causing other damage to mortar.

### 3.7 INSTALLATION OF TUCK POINTING MORTAR

- A. Immediately prior to application of mortar, dampen joints to be tuck pointed. Prior to application of pointing mortar, allow masonry units to absorb surface water.
- B. Tightly pack mortar into joints in thin layers, approximately 6 mm (1/4-inch) thick maximum.
- C. Allow layer to become "thumbprint hard" before applying next layer.
- D. Pack final layer flush with surfaces of masonry units. When mortar becomes "thumbprint hard", tool joints.

### 3.8 TOOLING OF JOINTS

- A. Tool joints with a jointing tool to produce a smooth, compacted, concaved joint.
- B. Tool joints in patch work with a jointing tool to match the existing surrounding joints.

### 3.9 FINAL CLEANING

- A. After mortar has fully hardened, thoroughly clean exposed masonry surfaces of excess mortar and foreign matter; use wood scrapers, stiff-nylon or -fiber brushes, and clean water, applied by low pressure spray.
  - 1. Do not use metal scrapers or brushes.
  - 2. Do not use acidic or alkaline cleaners.
  
- B. If stiff brushes and water are not effective, the surface shall be thoroughly wetted with clean water, scrubbed with a non-ionic detergent, and immediately rinsed with clear water.

**END OF SECTION 04 01 20.63**

**SECTION 04 20 00 – MASONRY****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

**1.2 GENERAL**

- A. Items Included but not limited to the following:

- Clay masonry units
- Concrete Masonry Units
- Mortar materials
- Cutting and patching of existing masonry
- Masonry flashing
- Cleaning of masonry
- Installation of steel lintels, furnished by others

- B. See Sections 04 01 00 and 04 01 13 for restoration specifications.

**PART 2 - PRODUCTS****2.1 MATERIALS**

- A. Face Brick shall be clay-fired brick. Brick shall match the brick on the existing buildings. Brick to conform to ASTM C-216, Type FBS, Grade SW for compressive strength, rupture, water absorption and efflorescence.
- B. Mortar shall be Type "S" per ASTM C-270.
  - 1. Use and proportioning of admixtures shall be as approved by Architect in advance. No admixtures shall be used in mortar containing more than 10% lime by volume. No calcium chloride or admixtures containing calcium shall be used in the work. No antifreeze material shall be used in the work.

- C. Limestone sills and shapes shall be match existing.
  - 1. Grade and color according to classification by ILI.
    - a. Grade: Standard
    - b. Color: To match existing.
    - c. Finish: To match existing.
    - d. Provide stone units accurately shaped with exposed faces dressed true with beds and joints at right angles to faces.
    - e. Comply with recommendations in Indiana Limestone Institute's "Indiana Limestone Handbook"
    - f. In shapes to match existing or as indicated on drawings.
- D. Concrete Block shall be load bearing type conforming to ASTM C90, Grade N-1 (moisture cured), and lightweight aggregate, hollow. Shapes and sizes shall be as required to achieve the intent of drawings.
- F. Horizontal joint reinforcing of 8" thick walls shall be 9 gauge ladder type of width as required. All walls to have horizontal reinforcing, spaced at 16" o.c. vertically.
- G. Flashing: As required shall be minimum 40 mil EPDM through-wall "Flash Gard" flashing material as manufactured by Firestone, Goodyear, Carlisle or equal product of another manufacturer.
- H. Isolation material: Shall be waterproof corrugated paper: "Column Box Board" as manufactured by Williams Products Co. or equal by Boomer Co. ("Column Wrap") or Granco Industries ("Brak-Bond").
- I. Brick Ties: Veneer anchors shall be adjustable anchors with wire ties as manufactured by Heckman or similar product of another manufacturer. Materials shall be hot dipped galvanized steel, tie hold to be 12 gauge material, wire ties to be 1/4" diameter. Space at 16" vertically and 16" horizontally.
- J. Brick Stain: Perma-Crete Color Seal WB Interior/Exterior Concrete Stain 4-4200 made for brush application to brick. Manufacturer: PPG Industries, Inc., Architectural Coatings, Pittsburgh, Pennsylvania.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Masonry shall be laid true, level, plumb and neatly in accordance with drawings. Walls shall be in uniform courses of regular running bond. Do not wet masonry units except in hot, dry weather when fog spray is to be used on units otherwise warm to the touch. Cut units accurately to fit adjacent work, and patch holes neatly. Plan the work carefully to minimize cutting. Take extreme care to prevent visible mortar stains. Absolutely no tothing of masonry work will be permitted.
- B. Lay full mortar coverage on foundation bed for starting joint. Provide full mortar coverage on face shells and on webs surrounding cells. Butter vertical head joints well for thickness of face shell. Once placed, a masonry unit shall be moved only for removal from wall to clean it of mortar. Set lintels and bearing plates in full bed of mortar. Tool joints to produce a slightly concave profile unless detailed otherwise.
- C. Tuckpointing of existing masonry shall be done as required before brick staining begins.
- D. Ladder reinforcement specified in Section 4A-02 shall be placed at every second block course. One layer shall adjoin course immediately above lintels or below sills. Lap longitudinal rods not less than one (1) foot. Cut inside rod at corners and bend to proper angle. Bond intersecting walls and partitions with extended ladder reinforcement.
- E. Provide open head joint weep holes at 24" on center in the second brick course above grade. Fill space behind brick veneer on membrane flashing at weep holes with a minimum of 8" of pea gravel. Verify finish grade elevation with the general contractor prior to starting brickwork.
- F. Limestone Units
  - 1. Set stone trim units in full bed of mortar with full vertical joints. Fill dowel, anchor, and similar holes.
    - a. Clean soiled surfaces with fiber brush and, if needed, a proprietary cleaner specifically for limestone. Rinse thoroughly with clear water.
    - b. Allow cleaned surfaces to dry before setting.
    - c. Wet limestone joint surfaces thoroughly before applying mortar.
  - 2. Utilize eye and pin anchors at all stone caps. Utilize anchors as required at all other locations. All stone anchors shall be stainless steel.

- G. Tuckpointing mixture shall be 3 parts sand, 1 part mortar and 1 part cement. Mortar joints shall be ground 3/4" deep and shall be cleaned of dust and debris. Tuckpointing mixture shall be in the prepared joints in two 3/8" applications. Mortar joints shall be struck to match profile of existing joints.
- I. Cleaning: Masonry cleaning of all walls shall be done in accordance with the manufacturer's recommendations. A sample wall shall be cleaned by this subcontractor. Cleaned sample shall be reviewed and approved by the Owner and the General Contractor prior to cleaning of all masonry walls.
- J. Protect masonry against freezing - when the temperature of the surrounding air is 40 degrees F and falling. Heat materials and provide temporary protection of completed portions of masonry work. Comply with the requirements of the governing code and with the "Construction and Protection Recommendations for Cold Weather Masonry Construction" of the Technical Notes on Brick and Tile Construction by the BIA (Brick Institute of America).
1. Frozen Materials and Work: Do not use frozen materials or materials mixed or coated with ice or frost. For masonry, which is specified to be wetted, comply with the SCPI recommendations. Do not build on frozen work. Remove and replace masonry work damaged by frost or freezing.
  2. Do not lower the freezing point of mortar by use of antifreeze agents. Non-antifreeze admixtures approved by the architect may be considered for use.
  3. The use of calcium chloride will not be allowed in any masonry work.

**END OF SECTION 04 20 00**

**SECTION 05 50 00 – METAL FABRICATIONS****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

**1.2 GENERAL**

- A. Items included but not limited to the following:
  - Steel lintels
  - Metal deck
- B. Submittals: Shop drawings will be required in accordance with the General Conditions. Verify measurements in field so that work will be fabricated to fit job conditions. At the proper time submit necessary templates and patterns to guide the work of masonry and other sections of the specifications for locating means of anchorage. Do not commence fabrication until reviewed shop drawings have been reviewed and returned by the Architect.

**PART 2 - PRODUCTS****2.1 MATERIALS**

- A. Primer paint shall be rust-inhibiting type as manufactured by Tnemec Co. ("99 Metal Primer") or Rust-Oleum Corp. ("M70-7615 Structural Primer"). Primer for galvanized steel shall be as manufactured by Tnemec Co. ("89 Tnemec-Grip") or Rust-Oleum Corp. ("Galvinoleum 3268 Red"). Prime coat all work.
- B. Loose Lintels: Provide loose steel lintels of sizes and shapes indicated for installations in the work. Lintel assemblies consisting of more than one unit shall be welded together to form one unit. Refer to Structural Notes on the drawings.
- C. Metal deck for supported slabs – Corrugated galvanized steel deck; 1", 24 gauge at exterior door slabs.

## PART 3 - EXECUTION

### 3.1 FABRICATION

- A. Fabricate members to dimensions, weights and arrangements shown on drawings, with framing according to detail drawings. Substitutions may be made using structural steel members of weights and dimensions differing from those shown if no change is made in architectural design and if substituted sections are at least equal to the original design in strength and stability as approved by the Structural Engineer.
- B. Shop connections shall be welded except as otherwise shown or specified. Where field splices are to be high-tension bolted, and if required by design stresses, increase section of members at splice point to compensate for bolt holes.
- C. Provide holes and cutting required for connection of passage of work of other sections of specifications, where indicated or required by conditions. All holes and cutting shall be subject to the Structural Engineer's approval.
- C. Shop paint all steelwork adjoining exterior walls using primer coat in minimum dry film thickness of 2 mils. Before painting, use wire brush to remove loose mill scale, rust, dirt, soil, etc. Use solvents to clean surfaces of heavy deposits of oil or grease.

### 3.2 INSTALLATION

- A. Provide anchorage devices and fasteners where necessary for securing metal items to in-place construction, including threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws and other connectors as required.
- B. Perform cutting, drilling and fitting required for installation of metal items. Set work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items, which are to be built into concrete, masonry or similar construction.
- C. Fit exposed connections accurately together to form tight hairline joints. Weld connections, which are to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind joints smooth and touch-up shop paint coat. Do not weld, cut or abrade the surfaces of exterior units which have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections.

- D. Comply with AWS Code for procedures of shielded metal-arc welding, appearance and quality of welds made, and methods used in correcting welding work.
- E. Field errors shall not be corrected by burning. Protect all adjacent finished surfaces during the progress of welding. Damaged surfaces shall be replaced at the cost of this subcontractor.
- F. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.
- G. At completion of the job, remove all protective coatings and devices and clean all surfaces according to recommended practices. Replace all damaged parts as directed.

**END OF SECTION 05 50 00**

**SECTION 06 10 00 - CARPENTRY****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

**1.2 GENERAL**

- A. The extent of the carpentry work is shown on the drawings.
- B. Items Included but not limited to the following:

- Stud framing and wall construction
- Blocking, shimming, grounds and furring as required
- Millwork and finish trim
- Rough hardware such as nails, screws, bolts, etc.
- Cabinets and casework, installation only.
- Countertops
- Window stools
- Closet rods and shelving
- Install finish hardware and doors

**1.3 QUALITY ASSURANCE:**

- A. Lumber Standard: Lumber shall conform to American Lumber Standards, bear grade and trademark of Manufacturer's Association under which produced and mill identification.
- B. Factory-mark each piece of lumber and plywood with grade, type, mill and grading agency, except omit marking from surfaces to be exposed with transparent finish or without finish.

**1.4 SUBMITTALS:**

- A. Shop Drawings - Provide 6 copies of shop drawings of all millwork indicating conformation to design intent, species of lumber, size and methods of fastening and fabrication to the Architect for approval.

**1.5 PRODUCT HANDLING:**

- A. Delivery and Storage: Keep materials dry during delivery and storage. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber and plywood, and provide air circulation within stacks.

**1.6 JOB CONDITIONS**

- A. Installer must examine the substrates and supporting structures and the conditions under which the carpentry work is to be installed, and notify the Contractor in writing of conditions detrimental to the work. Do not proceed with the installation until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.
- B. Coordination: Fit carpentry work to other work; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds and similar supports to allow proper attachment of other work.

**PART 2 - PRODUCTS****2.1 MATERIALS**

- A. Rough Lumber
  - 1. Studs, posts and miscellaneous light framing shall be #2 or better Spruce-Pine-Fir,(S.P.F.). Wall framing shall typically be of 2 x 4 or 2 x 6 (nominal size) wood studs and plates, stud spacing and sizes shall be as indicated on the drawings.
  - 2. All sill plates in contact with concrete shall be preservative treated. Sill plates at exterior walls shall rest on 1/2 inch thick glass fiber or polyfoam sealer blanket of full width of plate. Sill plates shall be anchored to foundation walls with 1/2 inch diameter hot dipped galvanized anchor bolts spaced at 4 feet center to center maximum.
  - 3. Subflooring shall be 3/4" thick 48/24 tongue-and-groove underlayment grade Southern Yellowpine plywood, interior grade with exterior glue or 3/4" tongue-and-groove oriented strand board (OSB). Subflooring shall have its long sheet dimensions perpendicular to the span direction of floor trusses, with ends of sheets staggered except at perimeter of the building. Subflooring shall be both glued and nailed to floor trusses.
  - 4. Sheathing at exterior walls and at gable ends shall be 7/16" thick C-D fir plywood with exterior glue or 7/16" thick oriented strand board (OSB).

5. Roof sheathing shall match existing roof sheathing thickness but be no less than 3/4 inch thick O.S.B. with exterior glue. Roof sheathing shall have unsupported edges blocked with "H" clips (one per unsupported space less than 48" and two for broader spaces).
6. Headers, rafters, sills, plates, etc. shall be Southern Pine or Douglas Fir, No. 2 or better with a minimum allowable bending stress of  $F_b = 1000$  psi, (1150 psi repetitive), shear stress  $F_v = 90$  psi, modulus of elasticity  $E = 1,6000,000$  psi according to the specific span dimensions contained in the National Forest Products Association span tables.
8. Nailers, interior blocking, grounds, bucks: utility or better grade of same species.
9. Exterior nailers and blocking: Utility grade spruce, pine, fir or equivalent grade of Southern Pine, surfaced four sides. Pressure treated resisting rot and fungus in areas in contact with concrete.
10. Plywood - Plywood for interior rough carpentry shall be C-D Interior APA in thickness shown on drawings, species to be selected accordingly. Plywood for electrical panel installation shall be 3/4" fire retardant.
11. Flashing around door and window openings shall be DuPont Tyvek "FlexWrap" system wrapping rough framing and sheathing at head, jambs and sill; bonds and corners. "FlexWrap" tape shall be an elastic, highly adhesive self-sealing butyl material with a polyolefin film. Installation shall be in strict accordance with manufacturer's printed instructions.
12. Preservative treatment of wood shall be a process of Koppers Company (Wolman Preservative Dept.), Osmose Wood Preserving Company or Protection Products Manufacturing Company. Lumber shall be impregnated with preservative salts in a closed cylinder by vacuum pressure process in accordance with treatment specifications of the processor. Each piece of treated lumber shall bear a brand denoting conformance to standards of the processor. All fasteners used with preservative treated lumber shall be stainless steel or hot dipped galvanized.
13. Adhesives
  - a. All adhesives, adhesive bonding primers, adhesive primers or any other primer shall have a VOC content of not more than 250g/L less water and less exempt compounds.
  - b. All adhesives, adhesive bonding primers, adhesive primers, sealants, sealant primers and any other primers shall have a VOC content of not more than the following less water and less exempt compounds, measured in grams per liter:

Subfloor adhesives	50
Drywall and panel adhesives	50
Multipurpose construction adhesives	70

## B. Rough Hardware

1. Provide and install all items of rough hardware necessary for a complete installation of work shown on drawings and/or specified herein. Rough hardware shall include nails, bolts, hangers, hurricane clips and anchors for attaching carpentry materials to other carpentry materials, to concrete or masonry except as those fastenings are regularly furnished with equipment and materials specified under another section. Hardware in contact with preservative treated lumber shall be stainless steel or hot dipped galvanized.

## C. Finish Lumber

1. Finish trim as called for on the drawings or as required shall be finger jointed pine or poplar. Trim and moldings shall match existing profiles. Maximum moisture content of all finish lumber not to exceed 11%.
2. Exposed plastic laminate surfacing shall be in color as manufactured by Formica Corp., Wilsonart or Nevamar. Laminate to have matte finish, color as selected by Architect.
3. Closet shelves and laundry shelves shall be ventilated epoxy or plastic-coated steel rod shelving, type 6609 with integral hanging rod for clothes, type 6605 for linen clothes. Clothes closet shelves shall be 12" deep, depth of linen closet shelves shall be 16". Support shelving at maximum of 42" on center. Use manufacturer's 'Corner Rounder' pieces for inside corner installations in living unit closets. Manufacturer: Schulte Corp. Cincinnati, Ohio, Closet Maid or Clairon.
4. Exposed plastic laminate surfacing shall be in selected colors as manufactured by Formica Corp., Wilsonart or Nevamar. Laminate to have matte finish, color as selected by Architect.
5. Window stools shall be 3/4" thick "cultured marble" material in color selected by the Architect.
6. Hardwood handrail shall be paint grade poplar, solid stock in round shaped configuration.
7. Handrail brackets for railings shall be type 059 heavy duty handrail bracket as manufactured by Ives Hardware. Color as selected by the Architect. Provide with toggle bolts and wood screws.
8. Casework in building shall satisfy "Custom Grade" requirements of AWI "Specifications", except as otherwise shown. Countertops shall have high density particleboard core self-edged in 1/16" plastic laminate with laminated splash 4" high at back and sidewalls.

9. Formaldehyde emission levels for casework and countertops shall not exceed 0.30 parts per million; all backs, edges and undersides of materials shall be sealed with a low VOC (max. 250 g/L) sealer.
10. Formaldehyde free plywood may be used. Countertops shall have cutouts for sinks where required. Casework shall be shop assembled as far as practicable and delivered ready for erection. See Division 11, Section 11A, Cabinet Work.
11. Access panel covers for non-rated walls shall be ABS plastic, friction fit type. Model 34056 by Oatey. See Division 9 for rated access covers.

## 2.2 TEMPORARY WORK

- A. Provide temporary enclosures at entrances with suitable doors having temporary hardware including locks. Furnish keys to the Owner.
- B. Provide necessary protections for finish work as directed and maintain such protections until final acceptance of building unless otherwise directed.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Secure rough framing plates to concrete with hot dipped galvanized expansion bolts spaced apart no further than 48 inches o.c. unless other spacing of bolts is shown. Ramset anchors will be acceptable for interior non-bearing partitions.
- B. Install all furring and all permanent or temporary grounds shown or required to complete the project, including furring and grounds for work of other sections of the specifications.
- C. Wall framing members shall occur at spacing indicated on the drawings. Studs at jambs of unit entrance doors and other locked doors in framed partitions shall be laterally braced by horizontal members on each side of openings, located at strike zone level of latch.
- D. Provide cross blocking in partitions to receive anchorage of grab bars, such assembly to withstand a hanging load of at least 300 pounds.
- E. Provide wood blocking of nominal 2-inch thickness for plumbing fixtures, cabinets, window blinds, light fixtures, towel bars, toilet paper holders, shower rods, paper towel dispensers, soap dishes, grab bars, etc. Blocking shall be utility grade Douglas Fir or spruce, pine, fir.

- F. All members shall be accurately cut and fitted into the respective locations plumb, square, level and true to line, permanently secured in proper position with lag screws, bolts or other fastenings and fittings as detailed, as necessary for structural stability or as herein specified to render the same, substantial and rigid. All bearings shall be accurately square cut.
- G. Cabinets shall be erected and securely anchored in place in plumb and level positions, using finishing moldings and filler pieces as necessary to fit the cabinets to the walls and ceilings.
- H. Finish woodwork of every nature shall be smoothly dressed prior to erection; finish shall be free from open joints, hammer and machine marks, and other structural defects and surface blemishes. Finish moldings shall be used on all rough ends of all woodwork. Moldings shall be of same material as woodwork.
- I. Wherever practicable, the means of fastening the various parts and members together shall be concealed, and where surface nailing is unavoidable, the nails shall be neatly set for putty stopping. Nailing through the finish surface of plastic laminated items is not acceptable.
- J. Cleanup - This contractor shall supply labor on items related to this work including the unloading of material and the disposing of, off site, all packaging materials and debris.

**END OF SECTION 06 10 00**

**SECTION 06 64 00 – FIBERGLASS REINFORCED PLASTIC PANELING**

**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. Plastic sheet paneling.

**1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
- B. Samples: For plastic paneling and trim accessories, in manufacturer's standard sizes.

**PART 2 -PRODUCTS**

**2.1 MANUFACTURERS**

- A. Source Limitations: Obtain plastic paneling and trim accessories from single manufacturer.
- B. See Interior Design Drawings for specific products and manufacturers.

**2.2 PLASTIC SHEET PANELING**

- C. Glass-Fiber-Reinforced Plastic Paneling: Gelcoat-finished, glass-fiber-reinforced plastic panels complying with ASTM D 5319. Panels shall be USDA accepted for incidental food contact.

1. Surface-Burning Characteristics: As follows when tested by a qualified testing agency according to ASTM E 84. Identify products with appropriate markings of applicable testing agency.
  - a. Flame-Spread Index: 25 or less.
  - b. Smoke-Developed Index: 450 or less.
2. Nominal Thickness: Not less than 0.075 inch.

### **2.3 ACCESSORIES**

- A. Trim Accessories: Manufacturer's standard vinyl extrusions designed to retain and cover edges of panels. Provide division bars, inside corners, outside corners, and caps as needed to conceal edges.
- B. Exposed Fasteners: Nylon drive rivets recommended by panel manufacturer.
- C. Concealed Mounting Splines: Continuous, H-shaped aluminum extrusions designed to fit into grooves routed in edges of factory-laminated panels and to be fastened to substrate.
- D. Sealant: Mildew-resistant, single-component, neutral-curing silicone sealant recommended by plastic paneling manufacturer and complying with requirements in Section 07 92 00 "Caulking & Sealants."

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 PREPARATION**

- A. Remove wallpaper, vinyl wall covering, loose or soluble paint, and other materials that might interfere with adhesive bond.
- B. Prepare substrate by sanding high spots and filling low spots as needed to provide flat, even surface for panel installation.

- C. Clean substrates of substances that could impair adhesive bond, including oil, grease, dirt, and dust.
- D. Condition panels by unpacking and placing in installation space before installation according to manufacturer's written recommendations.
- E. Lay out paneling before installing. Locate panel joints to provide equal panels at ends of walls not less than half the width of full panels.
  - 1. Mark plumb lines on substrate at panel joint locations for accurate installation.
  - 2. Locate trim accessories and panel joints to allow clearance at panel edges according to manufacturer's written instructions.

#### 1.4 INSTALLATION

- A. Install plastic paneling according to manufacturer's written instructions.
- B. Install panels in a full spread of adhesive.
- C. Install panels with fasteners. Layout fastener locations and mark on face of panels so that fasteners are accurately aligned.
  - 1. Drill oversized fastener holes in panels and center fasteners in holes.
  - 2. Apply sealant to fastener holes before installing fasteners.
- D. Install factory-laminated panels using concealed mounting splines in panel joints.
- E. Install trim accessories with adhesive. Do not fasten through panels.
- F. Fill grooves in trim accessories with sealant before installing panels, and bed inside corner trim in a bead of sealant.
- G. Maintain uniform space between panels and wall fixtures. Fill space with sealant.
- H. Maintain uniform space between adjacent panels and between panels and floors, ceilings, and fixtures. Fill space with sealant.
- I. Remove excess sealant and smears as paneling is installed. Clean with solvent recommended by sealant manufacturer and then wipe with clean dry cloths until no residue remains.

END OF SECTION 06 64 00

**SECTION 07 11 13 - BITUMINOUS DAMPPROOFING****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

**1.2 SUMMARY**

- A. Section Includes:
  - 1. Cold-applied, cut-back-asphalt damp proofing.

**1.3 ACTION SUBMITTALS**

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

**1.4 FIELD CONDITIONS**

- A. Weather Limitations: Proceed with application only when existing and forecasted weather conditions permit damp proofing to be performed according to manufacturers' written instructions.
- B. Ventilation: Provide adequate ventilation during application of damp proofing in enclosed spaces. Maintain ventilation until damp proofing has cured.

**PART 2 - PRODUCTS****2.1 MATERIALS, GENERAL**

- A. VOC Content: Products shall comply with VOC content limits of authorities having jurisdiction unless otherwise required.

**2.2      COLD-APPLIED, CUT-BACK-ASPHALT DAMPPROOFING**

- A.    Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1.    Henry Company.
  - 2.    W. R. Meadows, Inc.
  - 3.    Substitution per 01 25 00.
- B.    Trowel Coats: ASTM D 4586, Type I, Class 1, fibered.
- C.    Brush and Spray Coats: ASTM D 4479, Type I, fibered or nonfibered.

**2.3      AUXILIARY MATERIALS**

- A.    General: Furnish auxiliary materials recommended in writing by damp proofing manufacturer for intended use and compatible with bituminous damp proofing.
- B.    Cut-Back-Asphalt Primer: ASTM D 41.

**PART 3 - EXECUTION****3.1      EXAMINATION**

- A.    Examine substrates, areas, and conditions with Applicator present, for compliance with requirements for surface smoothness, surface moisture, and other conditions affecting performance of bituminous damp proofing work.
- B.    Proceed with application only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.

**3.2      PREPARATION**

- A.    Mask or otherwise protect adjoining exposed surfaces from being stained, spotted, or coated with damp proofing. Prevent damp proofing materials from entering and clogging weep holes and drains.
- B.    Clean substrates of projections and substances detrimental to the damp proofing work; fill voids, seal joints, and remove bond breakers if any, as recommended in writing by prime material manufacturer.

**3.3 APPLICATION, GENERAL**

- A. Comply with manufacturer's written instructions for damp proofing application, cure time between coats, and drying time before backfilling unless more stringent requirements are indicated.
  - 1. Apply damp proofing to provide continuous plane of protection.
  - 2. Apply additional coats if recommended in writing by manufacturer or to achieve a smooth surface and uninterrupted coverage.
  
- B. Where damp proofing footings and foundation walls, apply from finished-grade line to top of footing; extend over top of footing and down a minimum of 6 inches over outside face of footing.
  - 1. Extend damp proofing 12 inches onto intersecting walls and footings, but do not extend onto surfaces exposed to view when Project is completed.
  
- C. Where damp proofing exterior face of inner wythe of exterior masonry cavity walls, lap damp proofing at least 1/4 inch onto flashing, masonry reinforcement, veneer ties, and other items that penetrate inner wythe.
  - 1. Extend damp proofing over outer face of structural members and concrete slabs that interrupt inner wythe.
  - 2. Lap damp proofing at least 1/4 inch onto shelf angles supporting veneer.

**3.4 COLD-APPLIED, CUT-BACK-ASPHALT DAMPPROOFING**

- A. Concrete Foundations: Apply two brush or spray coats at not less than 1.25 gal./100 sq. ft. (0.5 L/sq. m) for first coat and 1 gal./100 sq. ft. for second coat or one trowel coat at not less than 4 gal./100 sq. ft.

**3.5 CLEANING**

- A. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

**END OF SECTION 07 11 13**

**SECTION 07 21 00 - THERMAL INSULATION****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

**1.2 SUMMARY**

- A. Section Includes:
  - 1. Glass-fiber blanket.
  - 2. Mineral-wool blanket.
  - 3. Blown in Cellulose.
  - 4. Rigid roof insulation

**1.3 ACTION SUBMITTALS**

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

**1.4 INFORMATIONAL SUBMITTALS**

- A. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- B. Evaluation Reports: For foam-plastic insulation, from ICC-ES.

**1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

**PART 2 - PRODUCTS****2.1 GLASS-FIBER BLANKET**

- A. Sustainability Requirements: Provide glass-fiber blanket insulation as follows:
1. Free of Formaldehyde: Insulation manufactured with 100 percent acrylic binders and no formaldehyde.
  2. Low Emitting: Insulation tested according to ASTM D 5116 and shown to emit less than 0.05-ppm formaldehyde.
- B. Glass-Fiber Blanket, Unfaced: 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. Basis-of-Design Product: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. CertainTeed Corporation.
    - b. Johns Manville; a Berkshire Hathaway company.
    - c. Owens Corning.
    - d. Substitutions per 01 25 00.

**2.2 MINERAL-WOOL BLANKETS**

- A. Mineral-Wool Blanket: ASTM C 665, Class A (faced surface with a flame-spread index of 25 or less per ASTM E 84); R Value R-19 (minimum) in exterior walls.
1. Basis-of-Design Product: Subject to compliance with requirements, provide comparable product by one of the following:
    - a. Thermafiber, Inc.; an Owens Corning company; FS-25.

**2.3 BLOWN IN CELLULOSE**

- A. Cellulose Insulation: Pneumatically blown dry into open and enclosed building assemblies. Pneumatically sprayed damp into open wall cavities
1. Basis-of-Design Product: Subject to compliance with requirements, provide comparable product by one of the following:

- a. Nu-Wool Company, Inc., 2472 Port Sheldon Street, Jenison, Michigan 49428. Toll Free (800) 748-0128. Phone (616) 669-0100. Fax (616) 669-2370. Website [www.nuwool.com](http://www.nuwool.com). E-mail [info@nuwool.com](mailto:info@nuwool.com).

## 2.4 RIGID ROOF INSULATION

- A. General: Preformed roof insulation boards manufactured or approved by roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated.
- B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces. 6" total thickness, R-30 (minimum).
- C. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches unless otherwise indicated.
- D. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.

### 3.2 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

### 3.3 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

- A. Blanket 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. 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.
- B. 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.
- C. Loose-Fill Insulation: Apply according to ASTM C 1015 and manufacturer's written instructions. Level horizontal applications to uniform thickness as indicated, lightly settle to uniform density, but do not compact excessively.

### 3.4 INSTALLATION OF BLOWN IN CELLULOSE

- A. Install cellulose insulation in accordance with manufacturer's instructions at locations indicated on the Drawings.
- B. Install cellulose insulation to uniform density without voids, gaps, or air pockets.
- C. Install cellulose insulation to density and depth to achieve required R-values.
- D. Pneumatically Blown Dry Cellulose Insulation:
  - 1. Pneumatically blow cellulose insulation after mechanical, plumbing, electrical, and other utility installations have been completed.
  - 2. Ensure heat-producing devices in attics have barriers constructed around them to prevent contact with cellulose insulation.
  - 3. Install cellulose insulation to a density of 1.6 to 3.5 lbs. per cu. ft.
- E. Pneumatically Sprayed Damp Cellulose Insulation:

1. Pneumatically spray cellulose insulation with controlled water fog for adhesion into open wall cavities after mechanical, plumbing, electrical, and other utility installations have been completed.
2. Install cellulose insulation to a density of 3.0 to 3.5 lbs. per cu. ft to prevent settling in wall cavities.
3. Use quantity of water in installation to ensure proper adhesion into wall cavities and proper density.

### 3.5 ROOF INSULATION INSTALLATION

- A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.
- B. Comply with roofing system and insulation manufacturer's written instructions for installing roof insulation.
- C. Install tapered insulation under area of roofing to conform to slopes indicated.
- D. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.
- E. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.
- F. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.
  1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
- G. Mechanically Fastened Insulation: Install each layer of insulation and secure to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
  1. Fasten insulation according to requirements in FM Global's "RoofNav" for specified Windstorm Resistance Classification.
  2. Fasten insulation to resist uplift pressure at corners, perimeter, and field of roof.

**3.6 PROTECTION**

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

**END OF SECTION 07 21 00**

**SECTION 07 31 00 – PVC ROOFING****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

**1.2 GENERAL**

- A. The extent of roofing work is shown on the drawings.
- B. Work included under this section includes, but is not limited, to the following:
  - Flashing and sheet metal
  - Gutters and Downspouts
  - PVC Roof Membrane
- C. Subcontract the roofing and associated work to a single firm specializing in the type of roofing required, so that there will be undivided responsibility for the performance of the work.
- D. SUBMITTALS: Manufacturer's Data, Roofing: Submit samples of shingles and prefinished sheet metal accessories to the Architect for selection of colors from the manufacturer's standard range.

**1.3 JOB CONDITIONS**

- A. Proceed with roofing work only after substrate construction and penetrating work have been completed.
- B. The Installer must examine the substrate and the conditions under which roofing work is to be performed, and notify the Contractor in writing of unsatisfactory conditions. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

**PART 2 - PRODUCTS****2.1 MATERIALS**

- A. Flashing and sheet metal
  - 1. Metallic flashing and sheet metal work shall be in accordance with the Architectural Sheet Metal Manual, latest edition, published by the Sheet Metal and Air Conditioning Contractor's National Association, Inc.
  - 2. Sheet metal shall be of aluminum in alloy 3003-H14 having a thickness of at least .024 inch. Sheet metal work in exposed locations shall receive a manufacturer applied vinyl coated baked enamel finish, color as selected by the Architect. Sheet metal that remains concealed may be mill finish.
- B. Gutters and downspouts shall be factory prefinished aluminum, 5" profile. Gutters to be minimum .032" thickness, downspouts to be minimum .027" thickness 3" x 4". Install with aluminum nails through field installed aluminum grommets into wood fascia behind gutters. Provide necessary straps, bends, elbows, etc., for downspouts.
- C. Splashblocks for each downspout outlet shall be precast concrete, 33" x 11" x 3" thick.

**2.2 MATERIALS – PVC ROOF**

- A. Manufacturer: Duro-Last Roofing, Inc., located at: 525 Morley Drive, Saginaw, MI 48601. Telephone: 800-248-0280. All roofing system components to be provided or approved by Duro-Last Roofing, Inc.
- B. Roofing Membrane: Duro-Last® PVC thermoplastic membrane conforming to ASTM D 4434, type III, fabric-reinforced, PVC, NSF/ANSI 347 Gold or Platinum Certification, and a product-specific third-party verified Environmental Product Declaration. Membrane properties as follows:
  - 1. Thickness: 60 mil.
  - 2. Exposed Face Color: White.
- C. Accessory Materials: Provide accessory materials supplied by or approved for use by Duro Last Roofing, Inc.
  - 1. Sheet Flashing: Manufacturer's standard reinforced PVC sheet flashing.
  - 2. Duro-Last Factory Prefabricated Flashings: manufactured using Manufacturer's standard reinforced PVC membrane.
    - a. Stack Flashings.
    - b. Curb Flashings.
    - c. Inside and Outside Corners.

- D. Sealants and Adhesives: Compatible with roofing system and supplied by Duro-Last Roofing, Inc.
1. Duro-Caulk® Plus.
  2. Strip Mastic.
- E. Slip Sheet: Compatible with roofing system and supplied by Duro-Last Roofing, Inc.
- F. Fasteners and Plates: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening membrane and insulation to substrate. Supplied by Duro-Last Roofing, Inc.
- G. Termination and Edge Details: Supplied by Duro-Last Roofing, Inc.
1. 2-Piece Compression Metal System.
- H. Vinyl Coated Metal: Supplied by Duro-Last Roofing, Inc. 24 gauge, hot-dipped galvanized, grade 90 metal with a minimum of 17 mil of Duro-Last membrane laminated to one side.
- I. Two-Way Roof Vents: Supplied by Duro-Last Roofing, Inc. Install a minimum of 1 vent for each 1,000 ft<sup>2</sup> (93 m<sup>2</sup>) of roof area.
- J. Walkways: Provide non-skid, maintenance-free walkway pads in areas of heavy foot traffic and around mechanical equipment. Duro-Last Roof Trak® III Walkway Pad.
- K. Contractor's Warranty: The contractor shall warrant the roof application with respect to workmanship and proper application for two (2) years from the effective date of the warranty issued by the manufacturer.
- L. Manufacturer's Warranty: Must be no-dollar limit type and provide for completion of repairs, replacement of membrane or total replacement of the roofing system at the then-current material and labor prices throughout the life of the warranty. In addition, the warranty must meet the following criteria:
- a. Warranty Period: 20 years from date issued by the manufacturer.
  - b. No exclusion for damage caused by ponding water.
  - c. No exclusion for damage caused by biological growth.
  - d. Issued direct from and serviced by the roof membrane manufacturer.
  - e. Transferable for the full term of the warranty.

**PART 3 - PRODUCTS****3.1 EXECUTION**

- A. Preparation of Substrate: Clean the roof sheathing of projections and substances detrimental to the work. Roofing subcontractor shall inspect substrate and notify the General Contractor in writing of any defects in the substrate, which may be detrimental to the work.
- B. Install flashings, etc. in accordance with manufacturer's standard installation procedures. Provide all accessories and other items essential to the completeness of the roofing and sheet metal installation. Nails, screws, bolts, clips, etc. shall be of a composition compatible with the metal to which it will contact.
- C. Guarantee: Furnish a written guarantee warranting all flashing and sheet metal to remain in good condition for a period of two (2) years following the date of final acceptance of the building and to promptly repair and place in good condition, without any additional expense to the Owner, any flashing and sheet metal which becomes defective within the period.
- D. PVC Roof Installation:
  - 1. Install insulation in accordance with the roof manufacturer's requirements.
  - 2. Insulation: Duro-Guard® ISO II (flat).
    - a. Install insulation in accordance with the roof manufacturer's requirements.
    - b. Insulation shall be adequately supported to sustain normal foot traffic without damage.
    - c. Where field trimmed, insulation shall be fitted tightly around roof protrusions with no gaps greater than ¼ inch.
    - d. No more insulation shall be applied than can be covered with the roof membrane by the end of the day or the onset of inclement weather.
    - e. If more than one layer of insulation is used, all joints between subsequent layers shall be offset by at least 6 inches.
    - f. Mechanical Attachment: Use only fasteners, stress plates and fastening patterns accepted for use by the roof manufacturer. Fastening patterns must meet applicable design requirements.
    - g. Install fasteners in accordance with the roof manufacturer's requirements. Fasteners that are improperly installed must be replaced or corrected.



6. Flashings: Complete all flashings and terminations as indicated on the drawings and in accordance with the membrane manufacturer's requirements.
  - a. Provide securement at all membrane terminations at the perimeter of each roof level, roof section, curb flashing, skylight, expansion joint, interior wall, penthouse, and other similar condition.
  - b. Do not apply flashing over existing thru-wall flashings or weep holes.
  - c. Secure flashing on a vertical surface before the seam between the flashing and the main roof sheet is completed.
  - d. Extend flashing membrane a minimum of 6 inches (152 mm) onto the main roof sheet beyond the mechanical securement.
  - e. Use care to ensure that the flashing does not bridge locations where there is a change in direction (e.g. where the parapet meets the roof deck).
7. Penetrations:
  - a. Flash all pipes, supports, soil stacks, cold vents, and other penetrations passing through the roofing membrane as indicated on the Drawings and in accordance with the membrane manufacturer's requirements.
  - b. Utilize custom prefabricated flashings supplied by the membrane manufacturer.
  - c. Existing Flashings: Remove when necessary to allow new flashing to terminate directly to the penetration.
8. Pipe Clusters and Unusual Shapes:
  - a. Clusters of pipes or other penetrations which cannot be sealed with prefabricated membrane flashings shall be sealed by surrounding them with a prefabricated vinyl-coated metal pitch pan and sealant supplied by the membrane manufacturer.

9. Roof Drains:
  - a. Coordinate installation of roof drains and vents.
  - b. Remove existing flashing and asphalt at existing drains in preparation for sealant and membrane.
  - c. Provide a smooth clean surface on the mating surface between the clamping ring and the drain base.
  
10. Walkways:
  - a. Install walkways in accordance with the membrane manufacturer's requirements.
  - b. Provide walkways where indicated on the Drawings.
  - c. Install walkway pads at roof hatches, access doors, rooftop ladders and all other traffic concentration points regardless of traffic frequency. Provided in areas receiving regular traffic to service rooftop units or where a passageway over the surface is required.
  - d. Do not install walkways over flashings or field seams until manufacturer's warranty inspection has been completed.

**END OF SECTION 07 31 00**

**SECTION 075423 - THERMOPLASTIC POLYOLEFIN (TPO) ROOFING****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. Adhered thermoplastic polyolefin (TPO) roofing system.
  - 2. Roof insulation.

**1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
- B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work, including:
  - 1. Base flashings and membrane terminations.
  - 2. Tapered insulation, including slopes.
  - 3. Roof plan showing orientation of steel roof deck and orientation of roofing, fastening spacings, and patterns for mechanically fastened roofing.
  - 4. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.

**1.4 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: A qualified manufacturer that is FM Global approved for roofing system identical to that used for this Project.
- B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

**1.5      DELIVERY, STORAGE, AND HANDLING**

- A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.
- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
  - 1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
- D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

**1.6      FIELD CONDITIONS**

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

**1.7      WARRANTY**

- A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.
  - 1. Special warranty includes roofing, base flashings, roof insulation, and other components of roofing system.
  - 2. Warranty Period: 15 years from date of Substantial Completion.

**PART 2 - PRODUCTS****2.1 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Carlisle Syntec Incorporated.
  2. Firestone Building Products.
  3. GAF Materials Corp.
  4. Johns Manville.
- B. Source Limitations: Obtain components including roof insulation for roofing system from same manufacturer as membrane roofing.

**2.2 PERFORMANCE REQUIREMENTS**

- A. General Performance: Installed roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roofing and base flashings shall remain watertight.
1. Accelerated Weathering: Roofing system shall withstand 2000 hours of exposure when tested according to ASTM G 152, ASTM G 154, or ASTM G 155.
  2. Impact Resistance: Roofing system shall resist impact damage when tested according to ASTM D 3746 or ASTM D 4272.
- B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roofing manufacturer based on testing and field experience.
- C. Roofing System Design: Tested by a qualified testing agency to resist the following uplift pressures:
1. Corner Uplift Pressure: See drawings.
  2. Perimeter Uplift Pressure: See drawings.
  3. Field-of-Roof Uplift Pressure: See drawings.
- D. FM Global Listing: Roofing, base flashings, and component materials shall comply with requirements in FM Global 4450 or FM Global 4470 as part of a built-up roofing

system, and shall be listed in FM Global's "RoofNav" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Global markings.

1. Fire/Windstorm Classification: Class 1A-60.
- E. Exterior Fire-Test Exposure: ASTM E 108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- F. Fire-Resistance Ratings: Comply with fire-resistance-rated assembly designs indicated. Identify products with appropriate markings of applicable testing agency.

### **2.3 TPO ROOFING**

- A. Fabric-Reinforced TPO Sheet: ASTM D 6878, internally fabric- or scrim-reinforced, uniform, flexible TPO sheet.
1. Thickness: 60 mils, nominal.
  2. Exposed Face Color: White.

### **2.4 AUXILIARY ROOFING MATERIALS**

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing.
1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
- B. Bonding Adhesive: Manufacturer's standard.
- C. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.
- D. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

### **2.5 SUBSTRATE BOARDS**

- A. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening substrate board to roof deck.

## 2.6 INSULATION ACCESSORIES

- A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with roofing.
- B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.
- C. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:
  - 1. Modified asphaltic, asbestos-free, cold-applied adhesive.

## 2.7 ASPHALT MATERIALS

- A. Roofing Asphalt: ASTM D 312, Type III or Type IV.

## 2.8 WALKWAYS

- A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads or rolls, approximately 3/16 inch thick and acceptable to roofing system manufacturer. Space 1"-3" apart to allow for roof drainage.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work:
  - 1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
  - 2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
  - 3. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Section 05 31 00 "Steel Decking."
  - 4. Verify that minimum concrete drying period recommended by roofing system manufacturer has passed.
  - 5. Verify that concrete substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.

6. Verify that concrete-curing compounds that will impair adhesion of roofing components to roof deck have been removed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.
- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.
- C. Install insulation strips according to acoustical roof deck manufacturer's written instructions.

### 3.3 ROOFING INSTALLATION, GENERAL

- A. Install roofing system according to roofing system manufacturer's written instructions.
- B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.
- C. Install roofing and auxiliary materials to tie in to existing roofing to maintain weathertightness of transition and to not void warranty for existing roofing system.

### 3.4 SUBSTRATE BOARD INSTALLATION

- A. Install substrate board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.
  1. Fasten substrate board to top flanges of steel deck according to recommendations in FM Global's "RoofNav" and FM Global Loss Prevention Data Sheet 1-29 for specified Windstorm Resistance Classification.

2. Fasten substrate board to top flanges of steel deck to resist uplift pressure at corners, perimeter, and field of roof according to roofing system manufacturers' written instructions.

### 3.5 INSULATION INSTALLATION

- A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.
- B. Comply with roofing system and insulation manufacturer's written instructions for installing roof insulation.
- C. Install tapered insulation under area of roofing to conform to slopes indicated.
- D. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.
- E. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.
- F. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.
  1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
- G. Mechanically Fastened Insulation: Install each layer of insulation and secure to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
  1. Fasten insulation according to requirements in FM Global's "RoofNav" for specified Windstorm Resistance Classification.
  2. Fasten insulation to resist uplift pressure at corners, perimeter, and field of roof.

### 3.6 ADHERED ROOFING INSTALLATION

- A. Adhere roofing over area to receive roofing according to roofing system manufacturer's written instructions. Unroll roofing and allow to relax before retaining.

- B. Start installation of roofing in presence of roofing system manufacturer's technical personnel.
- C. Accurately align roofing, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- D. Bonding Adhesive: Apply to substrate and underside of roofing at rate required by manufacturer, and allow to partially dry before installing roofing. Do not apply to splice area of roofing.
- E. In addition to adhering, mechanically fasten roofing securely at terminations, penetrations, and perimeter of roofing.
- F. Apply roofing with side laps shingled with slope of roof deck where possible.
- G. Seams: Clean seam areas, overlap roofing, and hot-air weld side and end laps of roofing and sheet flashings according to manufacturer's written instructions, to ensure a watertight seam installation.
  - 1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of sheet.
  - 2. Verify field strength of seams a minimum of twice daily, and repair seam sample areas.
  - 3. Repair tears, voids, and lapped seams in roofing that do not comply with requirements.
- H. Spread sealant bed over deck-drain flange at roof drains, and securely seal roofing in place with clamping ring.

### 3.7 BASE FLASHING INSTALLATION

- A. Install sheet flashings and preformed flashing accessories, and adhere to substrates according to roofing system manufacturer's written instructions.
- B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate, and allow to partially dry. Do not apply to seam area of flashing.
- C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.
- D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.

- E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

### 3.8 WALKWAY INSTALLATION

- A. Flexible Walkways: Install walkway products in locations indicated. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

### 3.9 PROTECTING AND CLEANING

- A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.
- B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 07 54 23

**SECTION 07 92 00 – CAULKING AND SEALANT****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

**1.2 GENERAL**

- A. The extent of caulking and sealant work is shown on the drawings and as described herein.
- B. The work under this section includes but is not limited to the following:
  - 1. Interior caulking
  - 2. Fire barrier caulking
  - 3. Exterior caulking and sealants
  - 4. Air Sealing package
- C. All items described below to be caulked and sealed.
  - 1. Interior: All door frames, perimeters of windows, window sills, toilets, bathtubs, showers, interior control joints, countertops, vanity tops, lavatories and all joints at butting of dissimilar materials.
  - 2. Exterior: Exterior window perimeters, HVAC openings, door perimeters, louvers, all joints at butting of dissimilar materials, all control joints and any other areas indicated on the drawings. Replace all existing exterior sealants. Bed all exterior thresholds in sealant.
- D. Provide and install a spray applied air and water barrier on the interior surface of all exterior masonry walls

**PART 2 - PRODUCTS****2.1 MATERIALS**

- A. Interior Joints - Latex based, colors to match finished surfaces. Pecora Corporation (AC-20 and Dynatrol); Tremco (Acrylic Latex).

- B. Fire Barrier Caulking - 3M CP25S/L Fire Barrier Self-Leveling Caulk and 3M CP 25N/S Fire Barrier No-Sag caulk.
- C. Joints Exposed to Exterior- Color to match adjacent materials. Maximum joint size shall not exceed 3/4" wide and 2" deep. Manufacturer: Dow Corning (#790), General Electrical (Silpruf and Silgaze).
- D. VOC (Volatile Organic Compound) content of caulks and sealants shall not exceed 250 grams per liter.

## 2.2 AIR AND WATER BARRIER

- A. Install a spray applied Air & Water Barrier over all interior surfaces of exterior masonry walls on all floor. – Fire Resist Barritech VP by Carlisle Coatings and Waterproofing. Apply to the interior side of all exterior masonry walls.
- B. Do not proceed with installation until substrate and project conditions conform to requirements specified in this document.
  - 1. Identify any membranes, coatings, sealants, tapes and joint compounds by others which will come into contact with Barritech VP and CCW accessories, and verify compatibility through CCW.
  - 2. All surfaces accepting Barritech VP and CCW accessories shall be clean, dry, frost free and of sound condition. Verify that wall assemblies are dried in, such that water intrusion will not occur from above, behind or around the membrane installation.
  - 3. Gaps and cracks shall be filled with materials and technique approved by CCW. All gaps exceeding 1/16" must be filled with Barribond sealant, Large gaps such as those commonly found in electrical/mechanical penetrations, structural steel penetrations, columns/beams, expansion/seismic joints, shelf angles, tie-ins to fenestration and transitions to other building assemblies shall be closed with rigid material such as mortar, or sheet metal to provide suitable surfaces for continuous installation of the air barrier.
  - 4. Mortar joints shall be struck flush or tooled and shall be free of voids. Mortar droppings shall be removed from brick ties and all other surfaces accepting Barritech VP and CCW accessories. Mortar joints shall be allowed to cure 3 days minimum before installation of Barritech VP.

**PART 3 - EXECUTION****3.1 INSTALATION – CAULKING AND SEALANTS**

- A. Preparation - shall be as per manufacturer's instructions. Thoroughly clean joints dry, free of dust, oil, grease.
- B. Application - shall be as per manufacturer's instructions. Caulk shall be gun applied through a nozzle opening of such a diameter so that the full bead of caulk completely fills the joint. Joint shall be tooled immediately to insure contact with inner faces and flush surface. Remove all excess and smears as work progresses.
- C. Seal openings in fire rated walls and floors with intumescent 3M Fire Barrier Caulking. Fill openings completely around penetrating items.
- D. Guarantee - Furnish a written guarantee warranting all caulking and sealants to remain in a serviceable, watertight, elastic and adhesive condition, not staining or injuring adjoining materials, for a period of one (1) year from the date of substantial completion of the building, and to make good without expense to the Owner any defects appearing in the work within that period.

**3.2 INSTALLATION – SPRAY APPLIED AIR AND WATER BARRIER**

- A. Prepare all interior sides of exterior masonry surfaces per manufacturers written directions, ensure all surfaces are clean of dirt, water, oil, grease and all deleterious materials. Install per manufacturers written instructions on interior surface of all exterior masonry walls.
- B. Apply Barritech VP with a 60 mil wet film thickness over masonry. Recommended spray tip sizes for airless spray are GHD 635 for high coverage and GHD 429 for detail coat. Please consult CCW's Spray Equipment Brochure for detailed information. Barritech VP may also be applied with a paint roller. For roller application, apply a minimum of two coats to build the target thickness. For roller application, allow Barritech VP to dry film between coats.

**END OF SECTION 07 92 00**

**SECTION 08 11 13 - HOLLOW METAL DOORS AND FRAMES****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

**1.2 SUMMARY**

- A. Section includes hollow-metal work for doors and frames.

**1.3 COORDINATION**

- A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

**1.4 SUBMITTALS**

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, and finishes.
- B. Shop Drawings: Include the following:
  - 1. Elevations of each door type.
  - 2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
  - 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
  - 4. Locations of reinforcement and preparations for hardware.
  - 5. Details of each different wall opening condition.
  - 6. Details of anchorages, joints, field splices, and connections.
  - 7. Details of accessories.
  - 8. Details of moldings, removable stops, and glazing.
  - 9. Details of conduit and preparations for power, signal, and control systems.

- C. Schedule: Provide a schedule of hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.

## 1.5 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each type of hollow-metal door and frame assembly, for tests performed by a qualified testing agency

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch- (102-mm-) high wood blocking. Provide minimum 1/4-inch (6-mm) space between each stacked door to permit air circulation.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Curries Company; an Assa Abloy Group company.
  - 2. Republic Doors and Frames.
  - 3. Steelcraft; an Ingersoll-Rand company.
  - 4. Substitutions per section 01 25 00.
- B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

### 2.2 REGULATORY REQUIREMENTS

- A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

**2.3 INTERIOR HOLLOW METAL DOORS AND FRAMES**

- A. Construct interior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Heavy-Duty Doors and Frames: SDI A250.8, Level 2. Typical Interior door and frame.
  - 1. Physical Performance: Level B according to SDI A250.4.
  - 2. Doors:
    - a. Type: As indicated in the Door and Frame Schedule.
    - b. Thickness: 1-3/4 inches (44.5 mm).
    - c. Face: Uncoated, cold-rolled steel sheet, minimum thickness of 0.042 inch (1.0 mm).
    - d. Edge Construction: Model 1, Full Flush.
    - e. Core: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core at manufacturer's discretion.
  - 3. Frames:
    - a. Materials: Uncoated steel sheet, minimum thickness of 0.053 inch (1.3 mm).
    - b. Construction: Welded.
  - 4. Exposed Finish: Prime.

**2.4 EXTERIOR HOLLOW-METAL DOORS AND FRAMES**

- A. Construct exterior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Extra-Heavy-Duty Doors and Frames: SDI A250.8, Level 3. All exterior doors and frames.
  - 1. Physical Performance: Level A according to SDI A250.4.
  - 2. Doors:
    - a. Type: As indicated in the Door and Frame Schedule.
    - b. Thickness: 1-3/4 inches (44.5 mm.)
    - c. Face: Metallic-coated steel sheet, minimum thickness of 0.053 inch (1.3 mm), with minimum A40 (ZF120) coating.
    - d. Edge Construction: Model 1, Full Flush.

- e. Core: Manufacturer's standard honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core at manufacturer's discretion.
  - i. Thermal-Rated Doors: Provide doors fabricated with thermal-resistance value (R-value) of not less than 2.1 deg F x h x sq. ft./Btu (0.370 K x sq. m/W) when tested according to ASTM C 1363.
- 3. Frames:
  - a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch (1.3 mm), with minimum A40 (ZF120) coating.
  - b. Construction: Welded.
- 4. Exposed Finish: Prime.

## 2.5 FRAME ANCHORS

### A. Jamb Anchors:

- 1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch (1.0 mm) thick, with corrugated or perforated straps not less than 2 inches (51 mm) wide by 10 inches (254 mm) long; or wire anchors not less than 0.177 inch (4.5 mm) thick.
- 2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch (1.0 mm) thick.
- 3. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.

## 2.6 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.
- D. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z (12G) coating 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.
- E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- F. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.
- G. Grout: ASTM C 476, except with a maximum slump of 4 inches (102 mm), as measured according to ASTM C 143/C 143M.
- H. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- I. Glazing: Comply with requirements in Section 088000 "Glazing."
- J. Grout Materials: Grout hollow metal frames solid with Isolatek CAFCO 300.
- K. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

## 2.7 FABRICATION

- A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Hollow-Metal Doors:
  1. Vertical Edges for Single-Acting Doors: Provide beveled or square edges at manufacturer's discretion.
  2. Top Edge Closures: Close top edges of doors with inverted closures of same material as face sheets.
  3. Bottom Edge Closures: Close bottom edges of doors where required for attachment of weather stripping with end closures or channels of same material as face sheets.

4. Exterior Doors: Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
- C. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
1. Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
  2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
  3. Jamb Anchors: Provide number and spacing of anchors as follows:
    - a. Masonry Type: Locate anchors not more than 16 inches (406 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c., to match coursing, and as follows:
      - 1) Two anchors per jamb up to 60 inches (1524 mm) high.
      - 2) Three anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
      - 3) Four anchors per jamb from 90 to 120 inches (2286 to 3048 mm) high.
    - b. Stud-Wall Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:
      - 1) Three anchors per jamb up to 60 inches (1524 mm) high.
      - 2) Four anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
      - 3) Five anchors per jamb from 90 to 96 inches (2286 to 2438 mm) high.
    - c. Compression Type: Not less than two anchors in each frame.
  4. Head Anchors: Two anchors per head for frames more than 42 inches (1067 mm) wide and mounted in metal-stud partitions.
  5. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
    - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
    - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

- D. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.
- E. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
  - 1. Reinforce doors and frames to receive non-templated, mortised, and surface-mounted door hardware.
  - 2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.
- F. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
  - 1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.
  - 2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
  - 3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
  - 4. Provide loose stops and moldings on inside of hollow-metal work.
  - 5. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

## 2.8 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
  - 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Drill and tap doors and frames to receive non-templated, mortised, and surface-mounted door hardware.

### 3.3 INSTALLATION

- A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.
- B. Hollow-Metal Frames: Install hollow-metal frames of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.
  - 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. At fire-rated openings, install frames according to NFPA 80.
    - b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
    - c. Install door silencers in frames before grouting.
    - d. Remove temporary braces necessary for installation only after frames have been properly set and secured.
    - e. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
    - f. Field apply bituminous coating to backs of frames that will be filled with grout containing antifreezing agents.

2. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.
  3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout or spray applied fire proofing.
  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 (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    - b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
    - c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
    - d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.
- C. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.
1. Non-Fire-Rated Steel Doors:
    - a. Between Door and Frame Jambs and Head: 1/8 inch (3.2 mm) plus or minus 1/32 inch (0.8 mm).
    - b. Between Edges of Pairs of Doors: 1/8 inch (3.2 mm) to 1/4 inch (6.3 mm) plus or minus 1/32 inch (0.8 mm).
    - c. At Bottom of Door: [3/4 inch (19.1 mm)] [5/8 inch (15.8 mm)] plus or minus 1/32 inch (0.8 mm).
    - d. Between Door Face and Stop: 1/16 inch (1.6 mm) to 1/8 inch (3.2 mm) plus or minus 1/32 inch (0.8 mm).
  2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
- D. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.
1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (51 mm) o.c. from each corner.

**3.4 ADJUSTING AND CLEANING**

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow-metal work immediately after installation.
- C. 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 11 13**

**SECTION 08 14 16 – DOORS AND FRAMES****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

**1.2 SCOPE OF WORK**

- A. The extent of wood doors and metal frames is shown on the drawings and the door schedule.
- B. Items included but not limited to the following:
  - 1. Wood doors with wood or metal Redi-frames.

Doors shall be manufactured in accordance with Basic Hardboard Standard ANSI/AHA 135.4-1982 and NWWDA I.S. 1.1.-87, sec. 3.7.3.(B).

**PART 2 - GENERAL****2.1 MATERIALS**

- A. Hollow Core Wood Doors – Doors shall be of size, type, and thickness as indicated on the Door Schedule. Doors shall have a factory prefinished flush woodgrain masonite surface with processed wood grid or corrugated honeycomb core. Doors to comply with ANSI/AHA 135.4-1982 and NWWDA I.S. 1.1-87, sec. 3.7.3 (B) and bear label identifying manufacturer and certifying compliance with standard specified. Hollow core wood doors shall be hung in prehung type wood frames, ¾" fingerjointed paint grade Ponderosa pine with planted stops.
- B. Solid Core Wood Doors – Doors shall be of size, type and thickness as indicated on the Door Schedule. Doors shall have a factory prefinished flush woodgrain Masonite surface with solid wood core. Doors to comply with ANSI/AHA 135.4-1982 and NWWDA I.S. 1.1.-87, sec. 3.7.3 (B) and bear label indentifying manufacturer and certifying compliance with standard specified.
- C. Prehung Wood Frames – Frames for living unit interior doors shall be fabricated from ¾ inch thick finger-jointed paint grade Ponderosa pine with planted stops.

- E. Metal Red-Frames – Prefinished, light gauge steel frames for interior wood doors to be “Redi-Frame” as manufactured by Timely Industries or Dunbarton Industries with clip-on steel or wood casings, see door details.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Installation of Wood Doors and Metal Frames:

Hang and place all wood doors and metal frames in accordance with manufacturer's instructions for type of construction in which they are placed.

Place doors and frames plumb and true so doors operate freely. Doors shall be hung with a uniform margin around frame and shall fit snugly against rubber bumpers.

**END OF SECTION 08 14 16**

## SECTION 08 33 13 - COILING COUNTER DOORS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Fire-rated counter doors.

#### 1.3 ACTION SUBMITTALS

- A. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.
  - 1. Include plans, elevations, sections, and mounting details.
  - 2. Include details of equipment assemblies, and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
  - 3. Show locations of controls, locking devices, detectors or replaceable fusible links, and other accessories.
  - 4. Include diagrams for power, signal, and control wiring.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For coiling counter doors to include in maintenance manuals.

**PART 2 - PRODUCTS****2.1 MANUFACTURERS, GENERAL**

- A. Source Limitations: Obtain coiling counter doors from single source from single manufacturer.
1. Overhead Door Co. 640 Series or similar by
  2. Cookson
  3. Cornell Iron Works
  4. Other manufacturer in accordance with Section 01 25 00 "Substitutions"

**2.2 FIRE-RATED COUNTER DOOR ASSEMBLY**

- A. Fire-Rated Counter Door: Overhead fire-rated coiling door formed with curtain of interlocking metal slats. UL or ULC 1-1/2-Hour Class B Label for installation in non-masonry walls, face mounted or between jambs.
- B. Operation Cycles: Door components and operators capable of operating for not less than 10,000. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.
- C. Fire Rating: 1 hour.
- D. Door Curtain Material: Flat Slat curtain design in primed galvanized steel with baked on polyester powder coat finish. Color to be selected by Architect from Manufacturers standard colors.
- E. Bottom Bar: Tubular locking bottom bar.
- F. Guides: Stainless steel shapes with brush smoke seals.
- G. Fastening Guides to Non-Masonry Fire Walls: Comply with the manufacturer's listing.
- H. Brackets: Silver powder coated steel to support counterbalance, curtain and hood.
- I. Counterbalance: Helical torsion spring type. Counterbalance shall be housed in a steel tube or pipe barrel.
- J. Hood:
1. FM approved hood shall be equipped with thermally controlled, internal flame baffle.
  2. Provide with UL Listed exterior brush smoke seal.
- K. Manual Operation:
1. Crank operation.

- L. Electric Motor Operation: Provide electric operator as listed in the door UL file, for size as recommended by manufacturer to move door in either direction.
  - 1. Sensing Edge Protection:
    - a. Electric sensing edge.
  - 2. Operator Controls:
    - a. Push-button operated control stations with open, close, and stop buttons.
- M. Automatic Closure:
  - 1. Standard Fire Door: UL approved release mechanism equipped with a 165 degree fusible link.
- N. Locking:
  - 1. Cylinder lock for electric operation with interlock switch.
- O. Wall Mounting Condition:
  - 1. Face-of-wall mounting.
- P. Stainless Steel wrapped Fire Rated Countertops: Provide counter fire doors with stainless steel wrapped fire rated countertops.
- Q. Mounting Hardware: Provide with all necessary mounting hardware.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.
- B. Examine locations of electrical connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### **3.2 INSTALLATION**

- A. Install coiling counter doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.
- B. Install coiling counter doors, hoods, controls, and operators at the mounting locations indicated for each door.

- C. Fire-Rated Doors: Install according to NFPA 80.
- D. Smoke-Control Doors: Install according to NFPA 80 and NFPA 105.

### 3.3 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
  - 1. Perform installation and startup checks according to manufacturer's written instructions.
  - 2. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.
  - 3. Test door closing when activated by detector or alarm-connected fire-release system. Reset door-closing mechanism after successful test.

### 3.4 ADJUSTING

- A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.
- B. Lubricate bearings and sliding parts as recommended by manufacturer.
- C. Adjust seals to provide tight fit around entire perimeter.

### 3.5 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of coiling-door Installer. Include **quarterly** preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for door operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
  - 1. Perform maintenance, including emergency callback service, during normal working hours.

END OF SECTION 08 33 13

**SECTION 08 53 00 – WINDOWS AND GLAZING PANELS****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

**1.2 SCOPE OF WORK**

- A. The extent of windows is shown on the drawings.
- B. Items included but not limited to the following:

- Single hung windows
- Insect Screens
- Insulated metal glazing panels

**PART 2 - PRODUCTS****2.1 MATERIALS - WINDOWS**

- A. Single hung windows, see drawings for required sizes and configurations. All windows must carry the label of an independent inspection agency certifying compliance with AAMA 101 for H-R45 windows. Windows shall be furnished with manufacturer's standard weatherstripping and hardware, screens and accessories in matching finish. Windows shall have thermal break frames and be factory glazed with 7/8" Energy Star Rated, low-E insulating glass with Argon. Frames shall be manufactured of welded .085 pvc, with integral color. Color(s) shall be selected by the Architect.
- B. Windows must carry certification of ANSI/AAMA 101 compliance. Windows shall be as manufactured by Silverline Windows (1-800-234-4228), V1 Series windows. Verify all existing window opening sizes prior to ordering windows.
- C. Window Condensation Resistance Factor, in accordance with AAMA 1503-98 specifications shall not be less than 45. The Overall Effective Thermal Transmittance Coefficient, tested at 15 mph. Dynamic wind speed, in accordance with NFRC-100, shall not exceed .75 BTU per square foot per hour per degree F. Maximum air infiltration, per ASTM 101/I.S. 2-97, at wind speed of 25 shall be no more than 0.3 cfm per foot of sash crack.

- D. Provide one piece aluminum framed screens with aluminum or fiberglass screen cloth for each operating window.
- E. Provide self-mulling hardware where required.
- F. Provide each window with security stops to limit window opening to 4".

## 2.2 MATERIALS – INSULATED GLZING PANEL

- A. Insulated glazing panel by Laminators Composite Panel Solutions, ([www.laminatorsinc.com](http://www.laminatorsinc.com)) Thermolite panels consists of a foam plastic core bonded on both sides to a thermoplastic stabilizer with a texture/color finished sheet of aluminum on each face and is manufactured in a laminated batch (i.e. discontinuous) process using adhesive(s) between dissimilar materials. Color selection to be made by the Architect from the Manufacturers full color range.
  - 1. Aluminum Sheets (in accordance with ASTM B209):
    - a. Face Thickness: 0.015 inch nominal or thicker
    - b. Backer Thickness: 0.0125 inch nominal or thicker
  - 2. Thickness / R-Value (hr °F ft<sup>2</sup> / BTU) (tested in accordance with ASTM C518):  
Thermolite R Value of 3.3 – 3.9/Inch

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Installation – Windows shall be installed straight, plumb and level without spring or distortion and shall be securely fastened in place in accordance with manufacturer's instructions. Mastic caulking shall be applied as required to provide a water-tight installation.
- B. Protect all finishes from damage during construction and clean same at the conclusion of the job.
- C. Adjust all windows and hardware for proper operation after installation.

END OF SECTION 08 53 00

**SECTION 087100 - DOOR HARDWARE****PART 1 - GENERAL****1.01 SUMMARY**

## A. Section includes:

1. Mechanical and electrified door hardware

## B. Section excludes:

1. Windows
2. Signage
3. Toilet accessories

**1.02 SUBMITTALS**

## A. General:

1. Submit in accordance with Conditions of Contract and Division 01 Submittal Procedures.
2. Prior to forwarding submittal:
  - a. Review drawings and Sections from related trades to verify compatibility with specified hardware.
  - b. Highlight, encircle, or otherwise specifically identify on submittals: deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.

## B. Action Submittals:

1. Product Data: Submit technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
2. Riser and Wiring Diagrams: After final approval of hardware schedule, submit details of electrified door hardware, indicating:
  - a. Wiring Diagrams: For power, signal, and control wiring and including:
    - 1) Details of interface of electrified door hardware and building safety and security systems.
    - 2) Schematic diagram of systems that interface with electrified door hardware.
    - 3) Point-to-point wiring.
    - 4) Risers.

3. Door Hardware Schedule:
  - a. Submit concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work critical in Project construction schedule.
  - b. Submit under direct supervision of a Door Hardware Institute (DHI) certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule published by DHI.
  - c. Indicate complete designations of each item required for each opening, include:
    - 1) Door Index: door number, heading number, and Architect's hardware set number.
    - 2) Quantity, type, style, function, size, and finish of each hardware item.
    - 3) Name and manufacturer of each item.
    - 4) Fastenings and other pertinent information.
    - 5) Location of each hardware set cross-referenced to indications on Drawings.
    - 6) Explanation of all abbreviations, symbols, and codes contained in schedule.
    - 7) Mounting locations for hardware.
    - 8) Door and frame sizes and materials.
    - 9) Degree of door swing and handing.
    - 10) Operational Description of openings with electrified hardware covering egress, ingress (access), and fire/smoke alarm connections.
4. Key Schedule:
  - a. After Keying Conference, provide keying schedule that includes levels of keying, explanations of key system's function, key symbols used, and door numbers controlled.
  - b. Use ANSI/BHMA A156.28 "Recommended Practices for Keying Systems" as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
  - c. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
  - d. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
  - e. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion. Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.
  - f. Prepare key schedule by or under supervision of supplier, detailing Owner's final keying instructions for locks.

## C. Informational Submittals:

1. Provide Qualification Data for Supplier, Installer and Architectural Hardware Consultant.
2. Provide Product Data:
  - a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
  - b. Include warranties for specified door hardware.

## D. Closeout Submittals:

1. Operations and Maintenance Data: Provide in accordance with Division 01 and include:
  - a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
  - b. Catalog pages for each product.
  - c. Final approved hardware schedule edited to reflect conditions as installed.
  - d. Final keying schedule
  - e. Copy of warranties including appropriate reference numbers for manufacturers to identify project.
  - f. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.

## E. Inspection and Testing:

1. Submit written reports to the Owner and Authority Having Jurisdiction (AHJ) of the results of functional testing and inspection for:
  - a. Fire door assemblies, in compliance with NFPA 80.
  - b. Required egress door assemblies, in compliance with NFPA 101.

**1.03 QUALITY ASSURANCE**

## A. Qualifications and Responsibilities:

1. Supplier: Recognized architectural hardware supplier with a minimum of 5 years documented experience supplying both mechanical and electromechanical door hardware similar in quantity, type, and quality to that indicated for this Project. Supplier to be recognized as a factory direct distributor by the manufacturer of the primary materials with a warehousing facility in the Project's vicinity. Supplier to have on staff, a certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) available to Owner, Architect, and Contractor, at reasonable times during the Work for consultation.

2. Installer: Qualified tradesperson skilled in the application of commercial grade hardware with experience installing door hardware similar in quantity, type, and quality as indicated for this Project.
  3. Architectural Hardware Consultant: Person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and meets these requirements:
    - a. For door hardware: DHI certified AHC or DHC.
    - b. Can provide installation and technical data to Architect and other related subcontractors.
    - c. Can inspect and verify components are in working order upon completion of installation.
    - d. Capable of producing wiring diagram and coordinating installation of electrified hardware with Architect and electrical engineers.
  4. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.
- B. Certifications:
1. Fire-Rated Door Openings:
    - a. Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction.
    - b. Provide only items of door hardware that are listed products tested by UL LLC, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.
  2. Smoke and Draft Control Door Assemblies:
    - a. Provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105
    - b. Comply with the maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at tested pressure differential of 0.3-inch wg (75 Pa) of water.
  3. Electrified Door Hardware
    - a. Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction.
  4. Accessibility Requirements:
    - a. Comply with governing accessibility regulations cited in "REFERENCES" article 087100, 1.02.D3 herein for door hardware on doors in an accessible route. This project must comply with all Federal Americans with Disability Act regulations and all Local Accessibility Regulations.

### C. Pre-Installation Meetings

1. Keying Conference
  - a. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:
    - 1) Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
    - 2) Preliminary key system schematic diagram.
    - 3) Requirements for key control system.
    - 4) Requirements for access control.
    - 5) Address for delivery of keys.
2. Pre-installation Conference
  - a. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
  - b. Inspect and discuss preparatory work performed by other trades.
  - c. Inspect and discuss electrical roughing-in for electrified door hardware.
  - d. Review sequence of operation for each type of electrified door hardware.
  - e. Review required testing, inspecting, and certifying procedures.
  - f. Review questions or concerns related to proper installation and adjustment of door hardware.
3. Electrified Hardware Coordination Conference:
  - a. Prior to ordering electrified hardware, schedule and hold meeting to coordinate door hardware with security, electrical, doors and frames, and other related suppliers.

#### 1.04 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site. Promptly replace products damaged during shipping.
- B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package. Deliver each article of hardware in manufacturer's original packaging.
- C. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.
- D. Provide secure lock-up for door hardware delivered to Project. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.

- E. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.
- F. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

#### 1.05 COORDINATION

- A. Installation Templates: Distribute for doors, frames, and other work specified to be factory or shop prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- B. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.
- C. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

#### 1.06 WARRANTY

- A. Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within published warranty period.
  - 1. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.
  - 2. Warranty Period: Beginning from date of Substantial Completion, for durations indicated in manufacturer's published listings.
    - a. Mechanical Warranty
      - 1) Locks
        - a) Falcon: 10 years
      - 2) Exit Devices
        - a) Falcon: 10 years
      - 3) Closers
        - a) Falcon SC Series: 10 years
      - 4) Automatic Operators
        - a) LCN: 2 years
    - b. Electrical Warranty
      - 1) Exit Devices
        - a) Von Duprin: 3 years

**1.07 MAINTENANCE**

- A. Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.
- B. Turn over unused materials to Owner for maintenance purposes.

**PART 2 - PRODUCTS****2.01 MANUFACTURERS**

- A. Approval of alternate manufacturers and/or products other than those listed as "Scheduled Manufacturer" or "Acceptable Manufacturers" in the individual article for the product category are only to be considered by official substitution request in accordance with section 01 25 00.
- B. Approval of products from manufacturers indicated in "Acceptable Manufacturers" is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer's product.
- C. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval.

**2.02 MATERIALS**

- A. Fabrication
  - 1. Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. provide screws according to manufacturer's recognized installation standards for application intended.
  - 2. Finish exposed screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
  - 3. Provide concealed fasteners wherever possible for hardware units exposed when door is closed. Coordinate with "Metal Doors and Frames", "Flush Wood Doors", "Stile and Rail Wood Doors" to ensure proper reinforcements. Advise the Architect where visible fasteners, such as thru bolts, are required.

- B. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.
  - 1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.
- C. Cable and Connectors:
  - 1. Where scheduled in the hardware sets, provide each item of electrified hardware and wire harnesses with number and gage of wires enough to accommodate electric function of specified hardware.
  - 2. Provide Molex connectors that plug directly into connectors from harnesses, electric locking and power transfer devices.
  - 3. Provide through-door wire harness for each electrified locking device installed in a door and wire harness for each electrified hinge, electrified continuous hinge, electrified pivot, and electric power transfer for connection to power supplies.

## 2.03 HINGES

- A. Manufacturers and Products:
  - 1. Scheduled Manufacturer and Product:
    - a. Ives 5BB series
  - 2. Acceptable Manufacturers and Products:
    - a. Hager BB1191/1279 series
    - b. McKinney TB series
    - c. Best FBB series
- B. Requirements:
  - 1. Provide hinges conforming to ANSI/BHMA A156.1.
  - 2. Provide five knuckle, ball bearing hinges.
  - 3. 1-3/4 inch (44 mm) thick doors, up to and including 36 inches (914 mm) wide:
    - a. Exterior: Standard weight, bronze or stainless steel, 4-1/2 inches (114 mm) high
    - b. Interior: Standard weight, steel, 4-1/2 inches (114 mm) high
  - 4. 1-3/4 inch (44 mm) thick doors over 36 inches (914 mm) wide:
    - a. Exterior: Heavy weight, bronze/stainless steel, 5 inches (127 mm) high
    - b. Interior: Heavy weight, steel, 5 inches (127 mm) high
  - 5. Adjust hinge width for door, frame, and wall conditions to allow proper degree of opening.

6. Provide three hinges per door leaf for doors 90 inches (2286 mm) or less in height, and one additional hinge for each 30 inches (762 mm) of additional door height.
7. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
  - a. Out-Swinging Exterior Doors: Non-removable pins
  - b. Out-Swinging Interior Lockable Doors: Non-removable pins

## 2.04 SPRING HINGES

### A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
  - a. Ives 3SP series
2. Acceptable Manufacturers and Products:
  - a. Hager 1250 series
  - b. McKinney 1502 series
  - c. Best 2060 series

### B. Requirements:

1. Provide hinges conforming to ANSI/BHMA A156.1.
2. Provide 3 knuckle, steel based, spring full mortise hinges.
3. Adjust hinge width for door, frame, and wall conditions to allow proper degree of opening.
4. Provide two spring hinges and one bearing hinge per door leaf for doors 90 inches (2286 mm) or less in height. Do not use spring hinges of door 96 inches and greater in height.

## 2.05 ELECTRIC POWER TRANSFER

### A. Manufacturers:

1. Scheduled Manufacturer and Product:
  - a. Von Duprin EPT-10
2. Acceptable Manufacturers and Products:
  - a. Securitron CEPT-10
  - b. Security Door Controls PTM
  - c. Precision EPT-12C

## B. Requirements:

1. Provide power transfer with electrified options as scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware.
2. Locate electric power transfer per manufacturer's template and UL requirements, unless interference with operation of door or other hardware items.

**2.06 FLUSH BOLTS**

## A. Manufacturers:

1. Scheduled Manufacturer:
  - a. Ives
2. Acceptable Manufacturers:
  - a. Burns
  - b. Rockwood
  - c. Trimco

## B. Requirements:

1. Provide automatic, constant latching, and manual flush bolts with forged bronze or stainless-steel face plates, extruded brass levers, and with wrought brass guides and strikes. Provide 12 inch (305 mm) steel or brass rods at doors up to 90 inches (2286 mm) in height. For doors over 90 inches (2286 mm) in height increase top rods by 6 inches (152 mm) for each additional 6 inches (152 mm) of door height. Provide dust-proof strikes at each bottom flush bolt.

**2.07 CYLINDRICAL LOCKS – GRADE 1**

## A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
  - a. Schlage ND series
2. Acceptable Manufacturers and Products:
  - a. Sargent 11-Line
  - b. Corbin-Russwin CL3100 series

## B. Requirements:

1. Provide cylindrical locks conforming to ANSI/BHMA A156.2 Series 4000, Grade 1, and UL Listed for 3-hour fire doors.

2. Indicators: Where specified, provide escutcheon with lock status indicator window on top of lockset rose:
  - a. Escutcheon height (including rose) 6.05 inches high by 3.68 inches wide.
  - b. Indicator window measuring a minimum 3.52-inch by .60 inch with 1.92 square-inches of front facing viewing area and 180-degree visibility with a total of .236 square-inches of total viewable area.
  - c. Provide snap-in serviceable window to prevent tampering. Lock must function if indicator is compromised.
  - d. Provide messages color-coded with full text and symbol, as scheduled, for easy visibility.
  - e. Unlocked and Unoccupied message will display on white background, and Locked and Occupied message will display on red background.
3. Cylinders: Refer to "KEYING" article, herein.
4. Provide locks with standard 2-3/4 inches (70 mm) backset, unless noted otherwise, with 1/2-inch latch throw. Provide proper latch throw for UL listing at pairs.
5. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.
6. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
7. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
8. Lever Trim: Solid cast levers without plastic inserts and wrought roses on both sides.
  - a. Lever Design: LATITUDE

## 2.08 CYLINDRICAL LOCKS – GRADE 2

### A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
  - a. Falcon W series
2. Acceptable Manufacturers and Products:
  - a. Corbin-Russwin CL3800 series
  - b. Sargent 6500 series
  - c. Dormakaba QCL 200 series

### B. Requirements:

1. Provide cylindrical locks conforming to ANSI/BHMA A156.2 Series 4000, Grade 2, and UL Listed for 3-hour fire doors.
2. Cylinders: Refer to "KEYING" article, herein.

3. Provide locks with standard 2-3/4 inches (70 mm) backset, unless noted otherwise, with 1/2-inch latch throw. Provide proper latch throw for UL listing at pairs.
4. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.
5. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
6. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
7. Lever Trim: Solid cast levers without plastic inserts and wrought roses on both sides.
  - a. Lever Design: LATITUDE

## 2.09 TUBULAR LOCKS – GRADE 2

### A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
  - a. Schlage F series
2. Acceptable Manufacturers and Products:
  - a. Sargent DL series
  - b. Dormakaba QTL200 series

### B. Requirements:

1. Provide tubular locks conforming to ANSI/BHMA A156.2 Series 4000, Grade 2, Grade 2 and ANSI/BHMA A156.39 Residential Grade AAA, and UL Listed for 3-hour fire doors.
2. Cylinders: Refer to "KEYING" article, herein.
3. Provide locks with standard 2-3/8 inches (60 mm) adjustable to 2-3/4 inches (70 mm) backset with 1/2-inch (13 mm) latch throw. Provide 2-3/4 inches (70 mm) backset, unless 2-3/8 inches (60 mm) is required by door or frame detail or noted otherwise.
4. Provide locksets that fit standard 2-1/8 inches (54 mm) diameter bore without use of thru bolts.
5. Door Thickness: Locksets adjustable to fit in 1-3/8 inches (35 mm) or 1-3/4 inches (44 mm) door thickness.
6. Provide standard T-strikes unless extended lip strikes are necessary to protect trim.
7. Lever Trim: Solid cast levers without plastic inserts and wrought roses on both sides.
  - a. Lever Design: LATITUDE

## 2.10 EXIT DEVICES

### A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
  - a. Falcon 24/25 series
2. Acceptable Manufacturers and Products:
  - a. Sargent 19-43-GL-80 series
  - b. Precision Apex series
  - c. Von Duprin 78/75 series

### B. Requirements:

1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1 and UL listed for Panic Exit or Fire Exit Hardware.
2. Cylinders: Refer to "KEYING" article, herein.
3. Provide touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.
4. Touchpad must extend a minimum of one half of door width. No plastic inserts are allowed in touchpads.
5. Provide exit devices with deadlatching feature for security and for future addition of alarm kits and/or other electrified requirements.
6. Provide flush end caps for exit devices.
7. Provide exit devices with manufacturer's approved strikes.
8. Provide exit devices cut to door width and height. Install exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.
9. Mount mechanism case flush on face of doors or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
10. Provide cylinder or hex-key dogging as specified at non fire-rated openings.
11. Provide electrified options as scheduled.
12. Provide exit devices with optional trim designs to match other lever and pull designs used on the project.

## 2.11 POWER SUPPLIES

### A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
  - a. Schlage/Von Duprin PS900 Series

2. Acceptable Manufacturers and Products:
  - a. Precision ELR series
  - b. Sargent 3500 series
  - c. Securitron BPS series
  - d. Security Door Controls 600 series
  
- B. Requirements:
  1. Provide power supplies approved by manufacturer of supplied electrified hardware.
  2. Provide appropriate quantity of power supplies necessary for proper operation of electrified locking components as recommended by manufacturer of electrified locking components with consideration for each electrified component using power supply, location of power supply, and approved wiring diagrams. Locate power supplies as directed by Architect.
  3. Provide regulated and filtered 24 VDC power supply, and UL class 2 listed.
  4. Provide power supplies with the following features:
    - a. 12/24 VDC Output, field selectable.
    - b. Class 2 Rated power limited output.
    - c. Universal 120-240 VAC input.
    - d. Low voltage DC, regulated and filtered.
    - e. Polarized connector for distribution boards.
    - f. Fused primary input.
    - g. AC input and DC output monitoring circuit w/LED indicators.
    - h. Cover mounted AC Input indication.
    - i. Tested and certified to meet UL294.
    - j. NEMA 1 enclosure.
    - k. Hinged cover w/lock down screws.
    - l. High voltage protective cover.

## 2.12 CYLINDERS

- A. Manufacturers and Products:
  1. Scheduled Manufacturer:
    - a. Falcon
  
  2. Acceptable Manufacturers and Products:
    - a. Corbin-Russwin
    - b. Sargent

## B. Requirements:

1. Provide cylinders/cores compliant with ANSI/BHMA A156.5; latest revision; cylinder face finished to match lockset; manufacturer's series as indicated. Refer to "KEYING" article, herein.
2. Provide cylinders in the below-listed configuration(s), distributed throughout the Project as indicated.
  - a. Open: cylinder with small format interchangeable core (SFIC) core with open keyway

**2.13 CYLINDERS**

## A. Manufacturers:

1. Scheduled Manufacturer and Product:
  - a. <INSERT EXISTING KEY SYSTEM>
2. Acceptable Manufacturers and Products:

## B. Requirements:

1. Provide cylinders/cores to match Owner's existing key system, compliant with ANSI/BHMA A156.5; latest revision; cylinder face finished to match lockset, manufacturer's series as indicated. Refer to "KEYING" article, herein.

**2.14 KEYING**

## A. Scheduled System:

1. New factory registered system:
  - a. Provide a factory registered keying system, complying with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.
2. Existing factory registered system:
  - a. Provide cylinders/cores keyed into Owner's existing factory registered keying system. Comply with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.

## B. Requirements:

1. Construction Keying:
  - a. Temporary Construction Cylinder Keying.
    - 1) Provide construction cores that permit voiding construction keys without cylinder removal, furnished in accordance with the following requirements.
      - a) Split Key or Lost Ball Construction Keying System.
      - b) 3 construction control keys, and extractor tools or keys as required to void construction keying.
      - c) 12 construction change (day) keys.
    - 2) Owner or Owner's Representative will void operation of temporary construction keys.
  - b. Replaceable Construction Cores.
    - 1) Provide temporary construction cores replaceable by permanent cores, furnished in accordance with the following requirements.
      - a) 3 construction control keys
      - b) 12 construction change (day) keys.
    - 2) Owner or Owner's Representative will replace temporary construction cores with permanent cores.
2. Permanent Keying:
  - a. Provide permanent cylinders/cores keyed by the manufacturer according to the following key system.
    - 1) Master Keying system as directed by the Owner.
  - b. Forward bitting list and keys separately from cylinders, by means as directed by Owner. Failure to comply with forwarding requirements will be cause for replacement of cylinders/cores involved at no additional cost to Owner.
  - c. Provide keys with the following features:
    - 1) Material: Nickel silver; minimum thickness of .107-inch (2.3mm)
    - 2) Patent Protection: Keys and blanks protected by one or more utility patent(s).
  - d. Identification:
    - 1) Mark permanent cylinders/cores and keys with applicable blind code for identification. Do not provide blind code marks with actual key cuts.
    - 2) Identification stamping provisions must be approved by the Architect and Owner.
    - 3) Stamp cylinders/cores and keys with Owner's unique key system facility code as established by the manufacturer; key symbol and embossed or stamped with "DO NOT DUPLICATE" along with the "PATENTED" or patent number to enforce the patent protection.
    - 4) Failure to comply with stamping requirements will be cause for replacement of keys involved at no additional cost to Owner.

- 5) Forward permanent cylinders/cores to Owner, separately from keys, by means as directed by Owner.
- e. Quantity: Furnish in the following quantities.
  - 1) Permanent Control Keys: 3.
  - 2) Master Keys: 6.
  - 3) Change (Day) Keys: 3 per cylinder/core that is keyed differently
  - 4) Key Blanks: Quantity as determined in the keying meeting.

## 2.15 KEY CONTROL SYSTEM

### A. Manufacturers:

1. Scheduled Manufacturer:
  - a. Telkee
2. Acceptable Manufacturers:
  - a. HPC
  - b. Lund

### B. Requirements:

1. Provide key control system, including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet, all as recommended by system manufacturer, with capacity for 150% of number of locks required for Project.
  - a. Provide complete cross index system set up by hardware supplier, and place keys on markers and hooks in cabinet as determined by final key schedule.
  - b. Provide hinged-panel type cabinet for wall mounting.

## 2.16 DOOR CLOSERS

### A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
  - a. Falcon SC70A series
2. Acceptable Manufacturers and Products:
  - a. LCN 4050 series
  - b. Norton 7500 series
  - c. Sargent 351 series
  - d. Yale 4400 series.

## B. Requirements:

1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. ISO 9000 certify closers. Stamp units with date of manufacture code.
2. Provide door closers with fully hydraulic, full rack and pinion action with aluminum cylinder.
3. Closer Body: 1-1/2-inch (38 mm) diameter with 5/8-inch (16 mm) diameter heat-treated pinion journal.
4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck.
7. Pressure Relief Valve (PRV) Technology: Not permitted.
8. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

**2.17 DOOR CLOSERS**

## A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
  - a. Falcon SC80A series
2. Acceptable Manufacturers and Products:
  - a. LCN 1450 series
  - b. Norton 8000 series
  - c. Sargent 1331 series
  - d. Yale 3000 series

## B. Requirements:

1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory.
2. Provide door closers with fully hydraulic, full rack and pinion action with aluminum cylinder.
3. Closer Body: 1-1/4-inch (32 mm) diameter, with 5/8-inch (16 mm) diameter heat-treated pinion journal.

4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck.
7. Pressure Relief Valve (PRV) Technology: Not permitted.
8. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

## 2.18 DOOR TRIM

### A. Manufacturers:

1. Scheduled Manufacturer:
  - a. Ives
2. Acceptable Manufacturers:
  - a. Burns
  - b. Trimco
  - c. Rockwood

### B. Requirements:

1. Provide push plates, push bars, pull plates, pulls, and hands-free reversible door pulls with diameter and length as scheduled.

## 2.19 PROTECTION PLATES

### A. Manufacturers:

1. Scheduled Manufacturer:
  - a. Ives
2. Acceptable Manufacturers:
  - a. Burns
  - b. Trimco
  - c. Rockwood

## B. Requirements:

1. Provide protection plates with a minimum of 0.050 inch (1 mm) thick, beveled four edges as scheduled. Furnish with sheet metal or wood screws, finished to match plates.
2. Size plates 2 inches (51 mm) less width of door on single doors, pairs of doors with a mullion, and doors with edge guards. Size plates 1 inch (25 mm) less width of door on pairs without a mullion or edge guards.
3. At fire rated doors, provide protection plates over 16 inches high with UL label.

**2.20 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS**

## A. Manufacturers:

1. Scheduled Manufacturers:
  - a. Glynn-Johnson
2. Acceptable Manufacturers:
  - a. Rixson
  - b. Sargent
  - c. ABH

## B. Requirements:

1. Provide overhead stop at any door where conditions do not allow for a wall stop or floor stop presents tripping hazard.

**2.21 DOOR STOPS AND HOLDERS**

## A. Manufacturers:

1. Scheduled Manufacturer:
  - a. Ives
2. Acceptable Manufacturers:
  - a. Burns
  - b. Trimco
  - c. Rockwood

## B. Provide door stops at each door leaf:

1. Provide wall stops wherever possible. Provide concave type where lockset has a push button or thumbturn.
2. Where a wall stop cannot be used, provide universal floor stops.
3. Where wall or floor stop cannot be used, provide overhead stop.

4. Provide roller bumper where doors open into each other and overhead stop cannot be used.

## 2.22 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

### A. Manufacturers:

1. Scheduled Manufacturer:
  - a. Zero International
2. Acceptable Manufacturers:
  - a. National Guard
  - b. Reese
  - c. Pemko

### B. Requirements:

1. Provide thresholds, weather-stripping, and gasketing systems as specified and per architectural details. Match finish of other items.
2. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
3. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.
4. Size thresholds 1/2 inch (13 mm) high by 5 inches (127 mm) wide by door width unless otherwise specified in the hardware sets or detailed in the drawings.

## 2.23 SILENCERS

### A. Manufacturers:

1. Scheduled Manufacturer:
  - a. Ives
2. Acceptable Manufacturers:
  - a. Burns
  - b. Rockwood
  - c. Trimco

### B. Requirements:

1. Provide "push-in" type silencers for hollow metal or wood frames.

2. Provide one silencer per 30 inches (762 mm) of height on each single frame, and two for each pair frame.
3. Omit where gasketing is specified.

## 2.24 BALL CATCHES

### A. Manufacturers:

1. Scheduled Manufacturer:
  - a. Ives
2. Acceptable Manufacturers:
  - a. Burns
  - b. Trimco
  - c. Rockwood

### B. Requirements:

1. Provide ball catches at single doors with strike to fit ANSI frame prep. If dummy levers are used in conjunction with ball catch, mount ball catch at a height as to not interfere with proper mounting and height of dummy lever.
2. Provide ball catches with full lip strike at pair doors. Mount rolling ball in top rail of each leaf per manufacturer's template.

## 2.25 DOOR POSITION SWITCHES

### A. Manufacturers:

1. Scheduled Manufacturer:
  - a. Schlage
2. Acceptable Manufacturers:
  - a. GE-Interlogix
  - b. Sargent

### B. Requirements:

1. Provide recessed or surface mounted type door position switches as specified.
2. Coordinate door and frame preparations with door and frame suppliers. If switches are being used with magnetic locking device, provide minimum of 4 inches (102 mm) between switch and magnetic locking device.

## 2.26 COAT HOOKS

- A. Manufacturers:
  - 1. Scheduled Manufacturer:
    - a. Ives
  - 2. Acceptable Manufacturers:
    - a. Burns
    - b. Rockwood
- B. Provide coat hooks as specified.

## 2.27 FINISHES

- A. FINISH: BHMA 626/652 (US26D); EXCEPT:
  - 1. Hinges at Exterior Doors: BHMA 630 (US32D)
  - 2. Aluminum Geared Continuous Hinges: BHMA 628 (US28)
  - 3. Push Plates, Pulls, and Push Bars: BHMA 630 (US32D)
  - 4. Protection Plates: BHMA 630 (US32D)
  - 5. Overhead Stops and Holders: BHMA 630 (US32D)
  - 6. Door Closers: Powder Coat to Match
  - 7. Wall Stops: BHMA 630 (US32D)
  - 8. Latch Protectors: BHMA 630 (US32D)
  - 9. Weatherstripping: Clear Anodized Aluminum
  - 10. Thresholds: Mill Finish Aluminum

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance. Verify doors, frames, and walls have been properly reinforced for hardware installation.
- B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- C. Submit a list of deficiencies in writing and proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 INSTALLATION

- A. Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.
  - 1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
  - 2. Custom Steel Doors and Frames: HMMA 831.
  - 3. Interior Architectural Wood Flush Doors: ANSI/WDMA I.S. 1A
  - 4. Installation Guide for Doors and Hardware: DHI TDH-007-20
- B. Install door hardware in accordance with NFPA 80, NFPA 101 and provide post-install inspection, testing as specified in section 1.03.E unless otherwise required to comply with governing regulations.
- C. Install each hardware item in compliance with manufacturer's instructions and recommendations, using only fasteners provided by manufacturer.
- D. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.
- E. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.
- F. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- G. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.
- H. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated.
- I. Lock Cylinders:
  - 1. Install construction cores to secure building and areas during construction period.
  - 2. Replace construction cores with permanent cores as indicated in keying section.
  - 3. Furnish permanent cores to Owner for installation.
- J. Wiring: Coordinate with Division 26, ELECTRICAL and Division 28 ELECTRONIC SAFETY AND SECURITY sections for:
  - 1. Conduit, junction boxes and wire pulls.
  - 2. Connections to and from power supplies to electrified hardware.
  - 3. Connections to fire/smoke alarm system and smoke evacuation system.

4. Connection of wire to door position switches and wire runs to central room or area, as directed by Architect.
  5. Connections to panel interface modules, controllers, and gateways.
  6. Testing and labeling wires with Architect's opening number.
- K. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.
- L. Continuous Hinges: Re-locate the door and frame fire rating labels where they will remain visible so that the hinge does not cover the label once installed.
- M. Door Closers & Auto Operators: Mount closers/operators on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Mount closers/operators so they are not visible in corridors, lobbies and other public spaces unless approved by Architect.
- N. Overhead Stops/holders: Mount overhead stops/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.
- O. Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room, or alternate location as directed by Architect.
- P. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."
- Q. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.
- R. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
- S. Door Bottoms and Sweeps: Apply to bottom of door, forming seal with threshold when door is closed.

### 3.03 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

1. Spring Hinges: Adjust to achieve positive latching when door can close freely from an open position of 30 degrees.
  2. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.
- B. Occupancy Adjustment: Approximately three to six months after date of Substantial Completion, examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors and door hardware.

### 3.04 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items per manufacturer's instructions to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

### 3.05 DOOR HARDWARE SCHEDULE

- A. The intent of the hardware specification is to specify the hardware for interior and exterior doors, and to establish a type, continuity, and standard of quality. However, it is the door hardware supplier's responsibility to thoroughly review existing conditions, schedules, specifications, drawings, and other Contract Documents to verify the suitability of the hardware specified.
- B. Discrepancies, conflicting hardware, and missing items are to be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application.
- C. Hardware items are referenced in the following hardware schedule. Refer to the above specifications for special features, options, cylinders/keying, and other requirements.
- D. Hardware Sets:

Legend:







 Link to catalog cut sheet

Hardware Group No. 01

For use on Door #(s):

100A	100B	100C	200A	200B	200C
300A	300B	300C	400A	400B	400C
500A	500B	500C			

Provide each SGL door(s) with the following:






QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5		652	IVE
1	EA	FIRE EXIT HARDWARE	F-25-R-L-BE-LAT		626	FAL
1	EA	OH STOP	410S		630	GLY
1	EA	SURFACE CLOSER	SC81A RW/PA		689	FAL
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

Hardware Group No. 02

For use on Door #(s):

101A	101B	101C	101D	201A	201B
201C	201D	301A	301B	301C	301D
401A	401B	401C	401D	501A	501B
501C	501D				

Provide each SGL door(s) with the following:







QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PASSAGE SET	W101S LAT		626	FAL
1	EA	SURFACE CLOSER	SC81A SS		689	FAL
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

Hardware Group No. 03

For use on Door #(s):

113	213	223C	313	314	413
414	515				

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PASSAGE SET	W101S LAT		626	FAL
1	EA	SURFACE CLOSER	SC81A RW/PA		689	FAL
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

Hardware Group No. 04

For use on Door #(s):

100A.1            100B.1            100C.1

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	PANIC HARDWARE	LD-25-R-EO	626	FAL
1	EA	SURFACE CLOSER	SC71A SS	689	FAL
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	429AA-S	AA	ZER
1	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	THRESHOLD	655A	A	ZER

Hardware Group No. 05

For use on Door #(s):

103

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	ND70BDC LAT	626	SCH
1	EA	SFIC CORE	C607	626	FAL
1	EA	SURFACE CLOSER	SC81A RW/PA	689	FAL
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64/SR65	GRY	IVE

Hardware Group No. 06

For use on Door #(s):

102 223A

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC PANIC HARDWARE	LMRX-MEL-25-R-NL-OP 24 VDC	626	FAL
1	EA	RIM HOUSING	C953	626	FAL
1	EA	SFIC CORE	C607	626	FAL
1	EA	90 DEG OFFSET PULL	8190HD 12" O	630	IVE
1	EA	OH STOP	100S	630	GLY
1	EA	SURFACE AUTO OPERATOR	4640 SERIES TBWMS X MTG AS REQ & INCLUDES ACTUATOR	630	LCN
1	EA	WEATHER RING	8310-802	PLA	LCN
2	EA	ACTUATOR, TOUCH	8310-852T	630	LCN
2	EA	MOUNT BOX	8310-869F		LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS	630	IVE
1	EA	RAIN DRIP	142AA	AA	ZER
1	SET	GASKETING	328AA H & J	AA	ZER
1	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	THRESHOLD	655A	A	ZER
1	EA	WIRE HARNESS (LENGTH AS REQ)	CON-XX		SCH
1	EA	CREDENTIAL READER	CREDENTIAL READER BY SECURITY CONTRACTOR		
1	EA	DOOR POSITION SWITCH	679-05HM	BLK	SCE
1	EA	POWER SUPPLY	PS902 BBK 900-4RL 120/240 VAC	LGR	SCE

DOOR NORMALLY CLOSED AND LOCKED AND EXTERIOR ACTUATOR DISABLED. PRESENTING VALID CREDENTIAL TO READER MOMENTARILY RETRACTS PANIC DEVICE LATCH ALLOWING ENTRY AND ENABLES EXTERIOR ACTUATOR. PRESSING EXTERIOR ACTUATOR WHEN ENABLED SIGNALS AUTOMATIC OPERATOR TO OPEN DOOR. INTERIOR ACTUATOR ENABLED AT ALL TIMES. PRESSING INTERIOR ACTUATOR RETRACTS PANIC DEVICE LATCH AND SIGNALS AUTOMATIC OPERATOR TO OPEN DOOR. FREE EGRESS AT ALL TIMES.

Hardware Group No. 07

For use on Door #(s):

112A 112B 116

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	W581BDC LAT	626	FAL
1	EA	SFIC CORE	C607	626	FAL
1	EA	OH STOP	410S	630	GLY
1	EA	SURFACE CLOSER	SC81A RW/PA	689	FAL
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER

Hardware Group No. 08

For use on Door #(s):

122

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PRIVACY LOCK W/ OUTSIDE INDICATOR	ND40S LAT OS-LOC	626	SCH
1	EA	SURFACE CLOSER	SC81A RW/PA	689	FAL
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER

Hardware Group No. 09

For use on Door #(s):

115

Provide each PR door(s) with the following:







QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
2	EA	MANUAL FLUSH BOLT	FB458	626	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	STOREROOM LOCK	W581BDC LAT	626	FAL
1	EA	SFIC CORE	C607	626	FAL
1	EA	OH STOP	410S	630	GLY
1	EA	SURFACE CLOSER	SC81A RW/PA	689	FAL
2	EA	KICK PLATE	8400 8" X 1" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
2	EA	SILENCER	SR64/SR65	GRY	IVE

Hardware Group No. 10

For use on Door #(s):

101E 117B

Provide each SGL door(s) with the following:








QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP		652	IVE
1	EA	CLASSROOM LOCK	W561BDC LAT		626	FAL
1	EA	SFIC CORE	C607		626	FAL
1	EA	SURFACE CLOSER	SC81A SS		689	FAL
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

Hardware Group No. 11

For use on Door #(s):

202 203

Provide each SGL door(s) with the following:








QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	ENTRY / OFFICE LOCK	W511BDC LAT		626	FAL
1	EA	SFIC CORE	C607		626	FAL
1	EA	SURFACE CLOSER	SC81A RW/PA		689	FAL
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

Hardware Group No. 12

For use on Door #(s):

204

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	ENTRY / OFFICE LOCK	W511BDC LAT		626	FAL
1	EA	SFIC CORE	C607		626	FAL
1	EA	OH STOP	410S		630	GLY
1	EA	SURFACE CLOSER	SC81A RW/PA		689	FAL
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

Hardware Group No. 13

For use on Door #(s):

117A

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	CLASSROOM LOCK	W561BDC LAT	626	FAL
1	EA	SFIC CORE	C607	626	FAL
1	EA	SURFACE CLOSER	SC81A RW/PA	689	FAL
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER

Hardware Group No. 14

For use on Door #(s):

5L	114A	118A	118B	223B	302
402	502	503	504	516	600B

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
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NOTE: DOOR NOT FOUND

Hardware Group No. 15

For use on Door #(s):

114B

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
-----	--	-------------	----------------	--------	-----

NOTE: DOOR NOT FOUND

Hardware Group No. U1

For use on Door #(s):

1B

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
2	EA	SPRING HINGE	3SP1 4 X 4		652	IVE
1	EA	HINGE	5BB1 4 X 4		652	IVE
1	EA	PASSAGE SET	F10F LAT		626	SCH
1	EA	SGL CYL DEADBOLT	B60 12-321 10-116		626	SCH
1	EA	DOOR STOP	060 OR 70 AS REQ'D		652	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER
1	EA	DOOR SWEEP	253A		A	ZER
1	EA	THRESHOLD	63A		A	ZER
1	EA	VIEWER	U698 (PROVIDE 2 @ADA UNITS)		626	IVE

Hardware Group No. U2

For use on Door #(s):

2A                      2B                      3A                      3B

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	1011 3.5 X 3.5		652	IVE
1	EA	PRIVACY LOCK	F40 LAT		626	SCH
1	EA	DOOR STOP	060 OR 70 AS REQ'D		652	IVE
1	EA	582 (PROVIDE AT BATHROOMS ONLY)	582		626	IVE

Hardware Group No. U3

For use on Door #(s):

4                                      5                                      6

Provide each SGL door(s) with the following:





QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	1011 3.5 X 3.5		652	IVE
1	EA	PASSAGE SET	F10 LAT		626	SCH
1	EA	DOOR STOP	060 OR 70 AS REQ'D		652	IVE

Hardware Group No. U4

For use on Door #(s):

7                      8                      9

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	1011 3.5 X 3.5	 652	IVE
2	EA	BALL CATCH	349	 626	IVE
2	EA	SINGLE DUMMY TRIM	F170 LAT	 626	SCH
2	EA	DOOR STOP	060 OR 70 AS REQ'D	 652	IVE

END OF SECTION

**SECTION 08 17 13 ELEVATOR FIRE DOORS****PART 1 GENERAL****1.01 GENERAL NOTE**

- A. The General Conditions, Supplementary General Conditions, and Division 1 - General Requirements are hereby made a part of this Section as fully as if repeated herein.

**1.02 SUMMARY**

- A. Section Includes

1. Integrated metal door opening assemblies with doors, operating hardware and accessories.

**1.03 SUBMITTALS**

- A. Shop Drawings

1. Indicate each door and frame condition; frame type, profile and installation detail; items of finish hardware, finishes and electrical rough-in requirements.

**1.04 QUALITY ASSURANCE**

- A. Regulatory Requirements

1. Rated door assemblies shall have been tested to meet conditions of NFPA 252 as required by NFPA 101 section 6-2.3.3.

**1.05 DELIVERY, STORAGE AND HANDLING**

- A. Packaging: Polyvinyl wrapped, palette by floor, and clearly marked for each opening.
- B. Delivery: Deliver to site in original unopened containers and pallets bearing system manufacturers name, and brand.
- C. Store: Horizontally on level surface, not less than 2 inches off floor in a clean, dry well-ventilated area protected from sunlight, extreme heat, dryness and moisture.
- D. Receiving, off-loading, and site distribution should be handled by an authorized Total Door Distributor unless otherwise stipulated by contract. If the G.C. or other entity handles all or any portion of the receiving, off-loading, and site distribution, they are held responsible for any and all damages that may result from potential miss handling of the product.

**1.06 WARRANTY**

- A. Integrated metal door opening assembly: Manufacturer's standard 5 year warranty against defects in material and workmanship. Refer to Manufacturer's published warranty.
- B. Store doors in a clear, dry ventilated space having controlled temperature and a relative humidity range between 30 and 60 percent. Stack doors flat and off the floor to prevent warpage.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Integrated metal door systems and hardware.
  - 1. Total Door: [www.totaldoor.com](http://www.totaldoor.com).
  - 2. Substitutions: Not permitted.

### 2.02 MATERIALS

- A. Frames
  - 1. [SafeFrame](#) by Total Door (Add to system schedule).
  - 2. In accordance with ANSI/SDI A250.8, SDI 111A, and SDI 112.
  - 3. Construction: KD
  - 4. Material: Steel, cold rolled, ASTM A1008, 16 gauge.
  - 5. Fire Resistance Rating: Where indicated in Contract Documents for doors.
- B. Frame Anchorage Devices
  - 1. To securely fasten to wall construction without distortion or stress.
  - 2. In accordance with fire resistance rating indicated in Contract Documents.
- C. Integrated Door Assembly
  - 1. Integrated Door Assembly
    - a. Stiles: Steel, galvanized, 16 gauge, spot welded.
    - b. Top and Bottom Rails: 5-1/2 inch 18 gauge steel rails.
    - c. Cores:
      - 1) Solid polystyrene continuously bonded to faces.
      - 2) Temperature Rise.
    - d. Thickness: 1-3/4 inches.
    - e. Faces: Steel, stretcher leveled, without seams or spot welds, galvanized 20 gauge.
    - f. Weld pattern: In accordance with manufacturer's standard details.
  - 2. Gasketing
    - a. Door System: Factory applied to locking channel.
    - b. Frame: Factory supplied, field apply to head of frame.
    - c. Floor: Factory supplied Surface Smoke Seal to be field applied. (must be ordered with elevator shaft & lobby applications)

### 2.03 FINISHES

- A. Hinge and Locking Channel
  - 1. Finish: Factory Pre-Finished.
    - a. **Color to be selected by Architect from manufacturers full range.**
- B. Door Faces, Interior
  - 1. Finish: **To be selected by Architect from manufacturers full range.**
- C. SafeFrame
  - 1. Finish: Factory Pre-Finished.
    - a. **Color to be selected by Architect from manufacturers full range.**

\*Recommend hinge, locking channel, and SafeFrame to be painted the same color to allow the system to blend with surrounding areas.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Field Conditions
  - 1. Prior to commencing installation, examine parts of building structure, which are to receive door systems and component parts.
  - 2. Report, in writing, conditions which would prevent proper execution or endanger permanency of the work to the Architect.
- B. Field Dimensions
  - 1. Verify frame tolerances before fabrication of door systems.
  - 2. Notify Architect of variances with reviewed shop drawings.
- C. Corrective measures, when necessary, shall be determined and approved prior to commencing fabrication.
- D. Coordinate door opening assembly details with adjacent work to assure proper attachments, clean junctions, etc.

### 3.02 INSTALLATION

- A. Install work in accordance with Contract Documents and reviewed shop drawings.
  - 1. Install door systems, including frame, in accordance with manufacturer's specifications.
  - 2. Installer: Manufacturer trained.
- B. Integrated Door Assembly
  - 1. Hang to maintain manufacturer's installation tolerances.
  - 2. Adjust to freely swing without binding, sticking, or sagging, and to eliminate excessive clearances.
- C. Hardware: When installation is otherwise complete, confirm proper operation and function.

### 3.03 HARDWARE


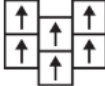
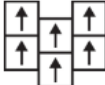
#### Set: 180° Pair Hold Open

2 ea	Full Height Hinges	H-13	Color TBD	Total Door
2 ea	Full Height Latch Channel	L-11	Color TBD	Total Door
2 ea	Operating Pulls	M32	628	Total Door
2 ea	Exit Device/insert to match skin	PF200 (Flush Panic)	628	Total Door
2 ea	Closer	TDC8907	Alum	Total Door
2 ea	Mag Holder	TDH100		Total Door
2 ea	Surface mounted smoke seal	W60		Total Door
2 ea	Positive Pressure label (confirm rating with door schedule)			Total Door
1 ea	Vision Panel	N Lite with FIRELITE NT		Total Door
	As required by ASME A17.1 Elevator Code 2015			
1 ea	SafeFrame	TDWMF	Color TBD	Total Door






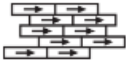
END OF SECTION 08 17 13

**PRELIMINARY Finish Specification-Common Areas- For Pricing Only**

**FLOOR FINISHES**

Item	Code	Description	Location	Manufacturer
<b>Flooring</b>				
1.	CPT-1	Carpet Tile	 <p>101 Corridors 201 Corridors 301 Corridors 401 Corridors 501 Corridors</p> <p><i>*Refer to Finish Plans for Locations</i></p>	<p><b>Manufacturer:</b> Tarkett  <b>Style Name:</b> Blockade  <b>Style Number:</b> 11471  <b>Color:</b> Cedar Deck 54603  <b>Product Type:</b> Modular  <b>Construction:</b> Stratatec® Patterned Loop  <b>Fiber Type:</b> Dynex SD® Nylon  <b>Gauge:</b> 5/64"  <b>Stitches per Inch:</b> 10/in  <b>Pile Height Average:</b> 0.140" (3.6mm)  <b>Dye Method:</b> Solution Dyed  <b>Secondary Backing:</b> Ethos® Modular with Om-nicoat Technology®  <b>Product Size:</b> 24" x 24"  <b>Adhesive:</b> C-EX or C-GU, dependent on RH levels  <b>Installation:</b> Vertical Ashlar</p>  <p><b>Local Rep:</b> Paul Brown 810.908.4344</p>
2.	CPT-2	Carpet Tile	 <p>103 Mail Room Office Corridor 202 Office 203 Office 204 Property Manager 302 Elevator Lobby 402 Elevator Lobby 502 Elevator Lobby</p> <p><i>*Refer to Finish Plans for Locations</i></p>	<p><b>Manufacturer:</b> Tarkett  <b>Style Name:</b> Soundblock  <b>Style Number:</b> 11472  <b>Color:</b> Cedar Deck 68204  <b>Product Type:</b> Modular  <b>Construction:</b> Stratatec® Patterned Loop  <b>Fiber Type:</b> Dynex SD® Nylon  <b>Gauge:</b> 5/64"  <b>Stitches per Inch:</b> 9.6/in  <b>Pile Height Average:</b> 0.187" (4.7mm)  <b>Dye Method:</b> 100% Solution Dyed  <b>Secondary Backing:</b> Ethos® Modular with Om-nicoat Technology™  <b>Product Size:</b> 24" x 24"  <b>Adhesive:</b> C-EX or C-GU, dependent on RH levels  <b>Installation:</b> Vertical Ashlar</p>  <p><b>Local Rep:</b> Paul Brown 810.908.4344</p>





**FLOOR FINISHES**

Item	Code	Description	Location	Manufacturer
<b>Flooring Continued</b>				
3.	WO-1	Walk off Carpet Tile	 <p>102 Vestibule 223 Vestibule 100A Stair- At Exterior Entry Only* 100B Stair- At Exterior Entry Only* 100C Stair- At Exterior Entry Only*  *Rest of Stairs &amp; Landings in RBR-1</p>	<p><b>Manufacturer:</b> Mannington <b>Collection:</b> Liaison Entryway <b>Style:</b> Recoarse II <b>Color:</b> Traverse Tan 8413 <b>Product Type:</b> Carpet Tile <b>Construction:</b> Patterned Loop <b>Secondary Backing:</b> Infinity• 2 Modular <b>Fiber:</b> 33 % type 6, 67 % type 6,6 nylon <b>Tufted Weight:</b> 38 oz/yd2 <b>Product Size:</b> 24" x 24" <b>Adhesive:</b> 33 % type 6, 67 % type 6,6 nylon <b>Installation Method:</b> Monolithic</p>  <p><b>Local Rep:</b> Aaron Brown 734.853.7390</p>
4.	LVT-1	Luxury Vinyl Tile	 <p>117 Community Room 314 Laundry 415 Laundry 515 Laundry</p>	<p><b>Manufacturer:</b> Shaw Contract <b>Collection:</b> Cultura <b>Style:</b> Crossing Paths 2.5 <b>Style Number:</b> 4431V <b>Color:</b> Thatch 91720 <b>Wear layer Thickness:</b> 20 mil (0.51 mm) <b>Total Thickness:</b> 0.098" (2.5 mm) <b>Finish:</b> Exoguard+ <b>Size:</b> 18" x 18" <b>Installation:</b> Direct Glue <b>Adhesive Options:</b> S150-95 Resilient Tile Spray, 4200 Resilient Tile 4 Gallon, 2200 Resilient Tile 4 Gallon, 4151 Multi-Use Premium 4 Gallon <b>Installation Method:</b> Monolithic</p>  <p><b>Local Rep:</b> Drew Pennington 248.310.9031</p>
5.	LVT-2	Luxury Vinyl Tile	 <p>Elevator 121 Storage 122 Unisex Bathroom  *Refer to Finish Plans for Layout</p>	<p><b>Manufacturer:</b> Shaw Contract <b>Collection:</b> Cultura <b>Style:</b> In Unison 2.5 <b>Style Number:</b> 4430V <b>Color:</b> Thatch 91720 <b>Wear layer Thickness:</b> 20 mil (0.51 mm) <b>Total Thickness:</b> 0.098" (2.5 mm) <b>Finish:</b> Exoguard+ <b>Size:</b> 9" x 36" <b>Installation:</b> Direct Glue <b>Adhesive Options:</b> S150-95 Resilient Tile Spray, 4200 Resilient Tile 4 Gallon, 2200 Resilient Tile 4 Gallon, 4151 Multi-Use Premium 4 Gallon <b>Installation Method:</b> Stagger</p>  <p><b>Local Rep:</b> Drew Pennington 248.310.9031</p>



**FLOOR FINISHES**

Item	Code	Description	Location	Manufacturer
<b>Flooring Continued</b>				
6.	VCT-1	<b>Vinyl Composition Tile</b>	213 Trash Room 313 Trash Room 414 Trash Room 514 Trash Room	<b>Manufacturer:</b> Tarkett <b>Style:</b> Tarkett VCT II <b>Color:</b> TBD <b>Size:</b> 12" x 12" <b>Total Thickness:</b> .125" <b>Installation Method:</b> Glue-down <b>Local Rep:</b> Paul Brown 810.908.4344
7.	RBR-1	<b>Rubber Landing Tile, Stair Treads &amp; Risers</b>	Stair A Stair B Stair C Stairs in Vestibule 102 Stairs in Vestibule 223	<b>Manufacturer:</b> Tarkett/ Johnsonite <b>Stairs:</b> Angle Fit Rubber Stair Tread with Integrated Riser <b>Landing Tile:</b> 24" x 24"  <b>Texture:</b> Hammered <b>Color:</b> Gateway TA4 <b>Local Rep:</b> Paul Brown 810.908.4344
8.	SC-1	<b>Sealed Concrete</b>	112 Electrical 113 Trash Room 114 Trash Room 115 Mechanical 116 Mechanical 214 Mechanical	<b>Sealed Concrete Per Architect's Specifications</b>



**WALL FINISHES**

Item	Code	Description	Location	Manufacturer
<b>Walls</b>				
9.	PT-1	<b>Main Paint</b>	 All walls with no Accent Paint Indicated	<b>Sherwin Williams</b> Color: SW 7036 Accessible Beige Locator Number: 249-C1 Finish: Eggshell
10.	PT-2	<b>Accent Paint</b>		<b>Sherwin Williams</b> Color: SW 6249 Storm Cloud Locator Number: 225-C5 Finish: Eggshell
11.	PT-3	<b>Accent Paint</b>		<b>Sherwin Williams</b> Color: SW 9105 Almond Roca Locator Number: 203-C5 Finish: Eggshell
12.	PT-4	<b>Accent Paint</b>		<b>Sherwin Williams</b> Color: SW 9171 Felted Wool Locator Number: 245-C4 Finish: Eggshell

**WALL FINISHES**

Item	Code	Description	Location	Manufacturer
<b>Walls Continued</b>				
13.	PT-5	Accent Paint		<b>Sherwin Williams</b> Color: TBD Locator Number: TBD Finish: Eggshell
14.	PT-6	Ceiling Paint	Gypsum Board Ceilings in Common Areas, Unless Accent is indicated	<b>Sherwin Williams</b> Color: Ceiling White Finish: Flat
15.	PT-7	Heavy Metal Door Paint		<b>Sherwin Williams</b> Color: TBD Locator Number: TBD Finish: Semi-Gloss @ Metal Doors
16.	PT-8	Unit Doors, Door Frame & Trim Paint		<b>Sherwin Williams</b> Color: SW 7048 Urbane Bronze Locator Number: 245-C7 Finish: Semi-Gloss
17.	WT-1	Wall Tile	 118 Kitchen- Backsplash 122 Unisex Bath- Plumbing Wall Only <i>*Refer to Finish Plans for Locations</i>	<b>Distributor: Dwyer Marble &amp; Stone</b> <b>Manufacturer: Envi Surfaces</b> <b>Style: Artsy</b> <b>Color: Ocean Glossy</b> <b>Size: 2" x 8"</b> <b>Local Rep: Joseph Lack 248.752.2863</b>

**MISCELLANEOUS FINISHES**

Item	Code	Description	Location	Specification
<b>Miscellaneous</b>				
18.	PL-1	<b>Plastic Laminate-Cabinetry</b>	 118 Kitchen 122 Unisex Bath	<b>Plastic Laminate Cabinetry</b> <b>Manufacturer:</b> Wilsonart <b>Color:</b> Pinnacle Walnut <b>Number:</b> 7992-38 <b>Note:</b> Grain to run vertical on all vertical surfaces
19.	SS-1	<b>Quartz Countertop</b>	 118 Kitchen 122 Unisex Bath	<b>Quartz Countertops</b> <b>Manufacturer:</b> MSI Quartz <b>Color:</b> Portico Cream
20.	WB-1	<b>Wall Base-Vinyl</b>	All locations with CPT-1, CPT-2 & WO-1:  Corridors, Elevator Lobbies, Offices Mailroom & Vestibules	<b>Vinyl Base</b> <b>Manufacturer:</b> Tarkett <b>Style:</b> Millwork Profile Base - Reveal <b>Size:</b> 4.25"H <b>Color:</b> TA4 Gateway
21.	WB-2	<b>Wall Base-Vinyl</b>	All Locations with LVT-1 & LVT-2:  Community Room, Laundry Rooms & Unisex Bathroom	<b>Vinyl Base</b> <b>Manufacturer:</b> Tarkett <b>Style:</b> Millwork Profile Base - Reveal <b>Size:</b> 4.25"H <b>Color:</b> 283 Toast
22.	WB-3	<b>Wall Base-Vinyl</b>	All Locations with VCT-1:  Trash Rooms	<b>Vinyl Base</b> <b>Manufacturer:</b> Tarkett <b>Style:</b> 4" Vinyl Cove Base <b>Size:</b> 4"H <b>Color:</b> TA4 Gateway





**MISCELLANEOUS FINISHES**

Item	Code	Description	Location	Specification
<b>Miscellaneous</b>				
23.	CR-1	<b>Chair Rail</b>	101 Corridors 201 Corridors 301 Corridors 401 Corridors 501 Corridors  <i>*Refer to Finish Plans for Locations</i>	<b>Rampart Chair Rail</b> <b>Manufacturer: Tarkett/ Johnsonite</b> <b>System Profile: Rampart (chair rail)</b> <b>Size: 4"H</b> <b>Color: TA4 Gateway</b> Number: CHR-TA4-C
24.	CG-1	<b>Corner Guards</b>	<i>Outside Edges at Drywall Corners in Corridors</i>	<b>Corner Guard</b> <b>Manufacturer: Tarkett/ Johnsonite</b> <b>System Profile: Corner Guard</b> <b>Size: 1.25" W</b> <b>Color: TA4 Gateway</b> Number: VBG-TA4-C



General Notes:

1. Multiple painted accent walls throughout. All walls not noted, to be painted PT-1. Refer to Finish Plans.
2. Chair Rails and Corner Guards in all Common Area Corridors. Refer to Finish Plans.
3. Transitions only at doorways, unless noted otherwise.

**PRELIMINARY Finish Specification – Units- For Pricing Only**

No.	Code	Description	Specification
<b>Finishes</b>			
1.	LVT-1U	Luxury Vinyl Tile- Throughout  	<b>Shaw Contract</b> Style: Terrain II 20 mil Style Number: 0454V Color: Elm 00761 Wear layer: 20 mil Overall Thickness: 2.5mm Size: 5.96" x 48" plank Installation: Direct Glue Installation Method: Staggered Local Rep: Drew Pennington 248.310.9031   Stagger
2.	PT-1U	Main Paint- Throughout  	<b>Sherwin Williams</b> Color: SW 7636 Origami White Locator Number: 259-C3 Finish: Eggshell
3.	PT-2U	Trim	<b>Sherwin Williams</b> Color: TBD Locator Number: TBD Finish: Semi-Gloss
4.	PT-3U	Ceiling	<b>Sherwin Williams</b> Color Name: Ceiling White Finish: Flat
5.	CAB-1U	Wood Cabinetry- Kitchens and Bathrooms  	<b>Williams Distributing</b> <b>Smart Cabinetry</b> Species: Maple Color: Slate Door Style: Brighton: Shaker Door with Flat panel drawers Type: Standard overlay Local Rep: Chris DeGiulio 248.217.4122

**Finish Specification – Units**

No.	Code	Description	Specification
<b>Finishes</b>			
6.	PL-1U	Plastic Laminate Counter Tops- Kitchen  	<b>Wilsonart</b> <b>Color:</b> Sierra Cascade <b>Number:</b> 5005-38
7.	CS-1U	Cultured Marble Bathroom Vanity Top	<b>Williams Distributing</b> <b>Marble Works</b> Cultured Marble Vanity Top with Integral sink <b>Style:</b> New Wave Bowl <b>Color:</b> Solid White MS300 <b>Local Rep:</b> Chris DeGiulio 248.217.4122
8.	VB-1U	Vinyl Base- Throughout  	<b>Vinyl Base</b> <b>Manufacturer:</b> Tarkett <b>Style:</b> 4" Vinyl Cove Base <b>Size:</b> 4"H <b>Color:</b> 283 Toast

**SECTION 09 29 00 – GYPSUM BOARD****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

**1.2 SCOPE OF WORK**

- A. The extent of drywall is shown on the drawings.
- B. Acceptable Manufacturers - Drywall, accessories, and all related products as necessary to complete the work shall be as manufactured by, Domtar, Gold Bond, U.S. Gypsum, or Celotex.

**PART 2 - PRODUCTS****2.1 MATERIALS**

- A. Fire-rated Drywall - Board shall be 5/8" thick with long edges tapered and shall bear Underwriter's Laboratories design number for type of use. Use type "X" drywall on walls and type "C" drywall on ceilings. Refer to drawings for assemblies requiring 1" core board.
- B. Non-fire Rated Drywall – Board shall be 1/2" thick with long edges tapered, of manufacturer's standard size.
- C. Moisture-resistant Drywall – Board shall be 5/8", thick regular or fire-rated as called for on the drawings. Use in areas at showers and bathtubs.
- D. Tile Backer Board – Board shall be 1/2" thick cement based, polymer coated, and glass fiber reinforced. Use behind all ceramic tile on walls and in bath and shower areas. Manufacturers: U.S. Gypsum Co. "Durock"; Modulars, Inc. "Wonder Board."
- E. Resilient furring channels – in locations shown on the drawings shall be Dietrich Metal Framing RC Deluxe (RCSD), 2-1/2" wide by 1/2" deep galvanized steel channels in lengths as necessary.

- F. Drywall Joint Materials - Joint tape shall be perforated type. Joint compound shall be a pre-mixed vinyl type.
- G. Fasteners - Manufacturer's recommended drywall type screws and nails in lengths necessary for proper securement to studs.
- H. Adhesives – ASTM C557 Drywall and panel adhesives shall have a maximum VOC content of 50 grams per liter, less water and less exempt compounds.
- I. Accessories - Corner beads as required for each protruding corner shall be 1" x 1-1/4" galvanized steel and shall be used on all external corners.
- J. Rated, Flush Access Doors with Concealed Flanges – For Public Areas and inside of Living Units:
  - 1. Chicago Metallic's GRG Access Doors – provide minimum size required.
- B. Fire-Rated, Flush Access Doors with Concealed Flanges – Typical Fire rated Access Door
  - 1. Assembly Description: Fabricate door to fit flush to frame, with a core of mineral-fiber insulation enclosed in sheet metal. Provide self-latching door with automatic closer and interior latch release. Provide frame with gypsum board or plaster beads for concealed flange installation.
  - 2. Locations: Wall and ceiling.
  - 3. Fire-Resistance Rating: 1 hour.
  - 4. Temperature-Rise Rating: 450 deg F at the end of 30 minutes.
  - 5. Uncoated Steel Sheet for Door: Nominal 0.036 inch, 20 gage.
    - a. Finish: Factory prime.
  - 6. Frame Material: Same material, thickness, and finish as door.
  - 7. Hinges: Manufacturer's standard.
  - 8. Latch: Cam latch.
  - 9. Lock: Cylinder.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. For non-fire rated partitions, attach drywall to studs at 12" o.c. throughout. For fire rated partitions attach drywall to studs at 8" o.c. in the field and 8" o.c. along the vertical abutting edges. Vertical joints on opposite sides of the partitions to be staggered. Where abutments are made between studs, free ends are to be back-blocked. No two such joints shall occur

between the same two studs. Conform to ANSI A97.1. Application for fire rated partitions to be as per Underwriters Laboratories for fire resistance required.

B. Preparation of Drywall Surfaces

1. All inside corners shall be coated with at least one coat of joint compound with edges feathered.
2. All nail and screw head dimples shall be filled flush with surface of wallboard.
3. All corner beads shall be concealed by two coats of joint compound. Feather out approximately 8" on both sides of exposed metal nose.
4. All wallboard and treated areas shall be sanded smooth. Do not roughen wallboard.
5. Finish drywall - A uniformly trim layer of joint compound shall be applied over joints and embedded in compound. Outside and inside wall angles shall be reinforced with the tape folded to conform to the angle. Drywall finish shall be done in the best workmanlike manner in preparation for finish painting and wall covering.
6. After the first and second applications of joint compound are thoroughly dry, apply third coat, spread approximately 3" on each side of tape and feather out onto panel faces and sand smooth.
7. Drywall installation and finishing procedures shall conform to the requirements of the "Gypsum Construction Handbook", latest edition.

**END OF SECTION 09 29 00**

**SECTION 09 30 00 – TILING****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

**1.2 SCOPE OF WORK**

- A. The extent of clay tile is shown on the drawings.
- B. Items included but not limited to the following:
1. Ceramic, porcelain and/or Quarry tile.
  2. Waterproof membrane at showers.
  3. Crack isolation membrane.
  4. Tile backing panels.
  5. Metal edge strips.

Porcelain tile  
Trim pieces  
Adhesives and grout

**PART 2 - PRODUCTS****2.1 MATERIALS**

- A. Porcelain Tile and Base- Porcelain tile shall be nominal 12" x 24" x 5/16" by American Olean (Crossville, Dal Tile or other approved manufacturer). Installation shall be by thin set method over concrete slab-on-grade. Joints shall be 1/4" wide, grouted fully with colored grout. Style: Historic Limestone, Color: HS12 Lineage. The static coefficient of friction for porcelain tile surfaces shall be 0.6 or higher in accordance with ADA slip resistance requirements. Base at porcelain tile shall be 12" x 4" x 5/16" of same material and color as porcelain tile floor with finished edge (NO RAW EDGES) or Schluter "Schiene" edge trim.
- B. Adhesive - Material shall be an organic adhesive as furnished by ceramic tile manufacturer. Application shall be as per manufacturer's recommendation for the type of surface on which the tile is to be installed. Adhesives, adhesive bonding primers, adhesive primers, other

primers shall have a VOC (Volatile Organic Compound) content not exceeding 65 grams per liter less water and less exempt compounds. Ceramic tile adhesives shall have a maximum VOC content of 65 grams per liter less water and less exempt compounds.

- C. Grout - Material shall be dry tile grout similar to Tile Mate Formula 763 as manufactured by Upco Chemical or approved equal. Application shall be as per manufacturer's recommendations. Color shall be as selected by the Architect from manufacturers standard colors.
- D. Waterproofing Membrane: Kerdi waterproofing membrane by Schluter Systems. Polyethylene faced on both sides with fleece webbing; 0.008-inch nominal thickness. Provide premanufactured corners, edges, etc. as required for a complete watertight installation.
- E. Metal Edge Strips: Angle or L-shape, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; stainless-steel, ASTM A 666, 300 Series exposed-edge material.
- F. Edging and outside wall corners: All tile to have a metal edge angle at all ends of run where setting bed and/or unfinished edges of tile are exposed. Use Schluter Systems "Jolly" trim. At outside tile corners, utilize either quirk mitered tile corners (1/8" max exposure) or Schluter Systems "Diadec" corner trim. Colors to be selected by Interior Designer to coordinate with tile finishes.
- G. Crack Isolation Membrane – install under all floor tile NOT on concrete. General: Manufacturer's standard product that complies with ANSI A118.12 for standard performance and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer. Polyethylene Sheet: Polyethylene faced on both sides with fleece webbing; 0.008-inch nominal thickness.
- H. Cementitious Tile Backer Units: ANSI A118.9 or ASTM C 1325, in maximum lengths available to minimize end-to-end butt joints. Provide behind all tiled walls in wet areas.

## **PART 3 - EXECUTION**

### **3.1 General**

- A. Comply with TCA's "Handbook for Ceramic Tile Installation" for TCA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

**3.2 TILE BACKING PANEL INSTALLATION**

- A. Install cementitious backer units and fiber-cement underlayment and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated. Use latex-Portland cement mortar for bonding material unless otherwise directed in manufacturer's written instructions.

**3.3 WATERPROOFING INSTALLATION**

- A. Install waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness and bonded securely to substrate.
- B. Do not install tile or setting materials over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

**3.4 CRACK ISOLATION MEMBRANE INSTALLATION**

- A. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness and bonded securely to substrate.
- B. Do not install tile or setting materials over crack isolation membrane until membrane has cured.

**3.5 CLEANING AND PROTECTING**

- A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
  - 1. Remove latex-Portland cement grout residue from tile as soon as possible.
  - 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
  - 3. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent drain clogging.
- B. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.
- C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
- D. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

**END OF SECTION 09 30 00**

**SECTION 09 65 00 – RESILIENT FLOORING****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

**1.2 SCOPE OF WORK**

- A. The extent of resilient flooring is shown on the drawings and finish schedule.
- B. Items included but not limited to the following:

- Resilient sheet flooring
- Luxury Vinyl tile
- Resilient stair treads and nosings
- Resilient base
- Adhesive

**PART 2 - PRODUCTS****2.1 MATERIALS**

- A. Samples - Samples of materials to be used shall be submitted to the Architect for color and pattern selection immediately upon request thereof.
- B. Resilient Floor Tile (VCT) – Material shall be standard commercial grade vinyl tile which meets the requirements of Federal Specifications SS-T-312 Type IV. Tile shall be 1/8" thick, 12" x 12" size. See Interior Design Drawings for specifications. Furnish two extra cartons of each type of floor tile used for future use by Owner.
- C. Luxury Vinyl Tile (LVT)
  - a. In Residential Units shall be equal to 2.5 mm Shaw Contract commercial luxury vinyl tile, Style: Terrain II 20 mil, Style # 0454V, Color: Elm 00761. Nominal dimensions 6" wide by 48" long.
  - b. In Public areas, LVT-1 shall be equal to 2.5 mm Shaw Contract commercial luxury vinyl tile, Style: Crossing Paths 2.5, Style # 4431V, Color: Thatch 91720. Nominal dimensions 18" wide by 18" long.

- c. In Public areas, LVT-2 shall be equal to 2.5 mm Shaw Contract commercial luxury vinyl tile, Style: In Unison 2.5, Style # 4430V, Color: Thatch 91720. Nominal dimensions 9" wide by 36" long.
- D. Resilient Base – All floor areas indicated on the finish schedule shall receive luxury vinyl base. Base shall be 4" high vinyl cove by Roppe, Johnsonite or equal. VB-1U to be Tarkett, color 283 Toast. WB-1 to be Tarkett Millwork Profile Base – Reveal, Color TA4 Gateway. WB-2 to be Tarkett Millwork Profile Base – Reveal, Color 283 Toast. WB-3 to be Tarkett Vinyl Cove Base, Color TA4 Gateway.
- E. Resilient Stair Tread & Nosing – Provide and install resilient tread and nosing on all common stairs. Nosing to have contrasting insert for the visually impaired. Nosing to be by Tarkett/Johnsonite, Angle Fit Rubber Stair Tread with Integrated Riser. Landing Tile to be 24" x 24". Color to be Gateway TA4.
- F. Adhesive – Application material for vinyl tile and vinyl base shall be as per flooring manufacturer's recommendations for specific material, and the surface to which it is applied. Adhesive shall be an asphalt emulsion type similar to Amtic #350 or Armstrong Permiflor cement.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Installation of all materials as specified under this section shall be as per flooring manufacturer's recommendations.
- B. This subcontractor is responsible for whatever surface preparation is required prior to installation of flooring including vacuum cleaning, if required, to prepare surface in accordance with flooring manufacturer's recommendations.
- C. Apply one coat of manufacturer recommended sealer to fully cleaned vinyl composition tile floors prior to turning area over to owner.
- D. This subcontractor is responsible for disposing of all cartons, containers, scrap, etc. related to this work. All materials shall be disposed of off the jobsite.

END OF SECTION 09 65 00

**SECTION 09 68 00 - CARPET****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

**1.2 SCOPE OF WORK**

- A. The extent of carpeting is shown in the drawings and the finish schedule.
- B. Items included but not limited to the following:
  - Carpet
  - Adhesive
  - Installation accessories
- C. Certification – The Contractor shall furnish a written certification from the manufacturer that the carpet(s) furnished under this specification meets all the requirements contained herein. Carpet and Rug Institute's "Green Label" certified carpet shall be used.

**PART 2 - PRODUCTS****2.1 MATERIALS**

- A. Lobby walkoff carpet to be Mannington, Style: Recoarse II, Color: Traverse Tan 8413, Weight: 38 oz, Size: 24" x 24", Installation method: Monolithic.
- B. Carpet in Corridors to be Tarkett, Style: Blockade Style # 11471, Color: Cedar Deck 54603, Size 24" x 24", Installation Method: Vertical Ashlar.
- C. Carpet in Office Areas to be Tarkett, Style: Soundblock, Style # 11472, Color: Cedar Deck 68204, Size 24" x 24", Installation Method: Vertical Ashlar.

- D. Carpet shall be solution dyed nylon with fire hazard classification of Class A or Class B per ASTM E-84. Pile weight per square yard shall be as specified above. Carpet shall have a synthetic secondary backing and shall meet requirements of FHA Bulletin UM 44D for Type II carpets (Class 2 for corridors and common areas, Class 1 for living units). Testing laboratory reports indicating compliance with UM-44D requirements shall be submitted for each proposed carpet at the time samples are submitted. Each carpet shall have a maximum emission factor measured in mg/m<sup>2</sup> as follows:

Total volatile organic compounds	0.5	mg/m <sup>2</sup> – hr
4-PC (4-Phenylcyclohexene)	0.05	mg/m <sup>2</sup> – hr
Formaldehyde (to prove none is used)	0.05	mg/m <sup>2</sup> – hr
Styrene	0.4	mg/m <sup>2</sup> - hr

- E. Samples – The Contractor shall furnish to the Architect a complete set of samples indicating patterns and colors of material to be used for his use in selecting colors and patterns for the building.
- F. The carpet subcontractor shall submit a complete layout of each area to be carpeted, showing the pattern direction, location of seams and location of edge strips. Do not proceed with any installation until this layout plan has been reviewed by the General Contractor and the Architect.
- G. Unless otherwise called for by the drawings or finish schedule, all carpet colors and/or patterns will be selected by the Architect and approved by the Owner from the manufacturer's current standard colors and patterns. All materials shall be packaged, stored, and handled carefully so as to prevent damage.
- H. Carpet Edge Guard – Manufacturer's standard bend-down type or formed or extruded aluminum carpet edge guard stripping. Provide mill or natural aluminum finish.
- I. Carpet cushion shall satisfy any conditions imposed by H.U.D. UM-72 dated 2/6/80 for carpet in its location and shall be Carpet and Rug Institute (CRI) "Green Label" approved. Where applicable to its materials, carpet cushion shall also satisfy "Bonded Urethane Carpet Cushion" (Use of Materials Bulletin No. 47a dated July 8, 1971) as published by H.U.D. Carpet padding shall be 3/8" thick. Padding is not to be installed in building stairwells, public areas within the building and in physically handicapped living units. Provide tack strip, edge guards, receptor tracks and all other accessories for a complete installation, including manufacturer's recommended cement for direct glued carpets. Carpet cushion shall have a maximum emission factor as follows:
- |                                  |      |                        |
|----------------------------------|------|------------------------|
| Total volatile organic compounds | 1.00 | mg/m <sup>2</sup> – hr |
| BHT (butylated hydroxytoluene)   | 0.30 | mg/m <sup>2</sup> – hr |
| Formaldehyde                     | 0.05 | mg/m <sup>2</sup> – hr |
| 4-PC (4-phenylcyclohexene)       | 0.05 | mg/m <sup>2</sup> - hr |

- J. Tackless strips as manufactured by Roberts Co. or Roths Co.
- K. Carpet adhesive shall be Carpet and Rug Institute (CRI) "Green Label" approved as manufactured by Advanced Adhesive Technologies, All Purpose Adhesive Co., Mapei, Inc., W.W. Henry Co., Chicago Adhesives Products Co. Carpet adhesive shall have a maximum emission factor measured in mg/m<sup>2</sup> – hr as follows:
- |                                  |                             |
|----------------------------------|-----------------------------|
| Total volatile organic compounds | 10.0 mg/m <sup>2</sup> – hr |
| Formaldehyde                     | .05 mg/m <sup>2</sup> – hr  |
| 2-Ethyl-1-Hexanol                | 3.00 mg/m <sup>2</sup> - hr |
- L. Aluminum Receptor Track – Standard mill finish aluminum with vinyl snap down "T" piece installed at suite entry door at transition of unit and corridor carpet.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Install – Prior to installation of carpet and its accessories this contractor shall be responsible to clean all debris, oil stains, concrete accumulations and all other conditions from the subfloor which will affect the proper installation of the carpet and its accessories.
- B. Padding – Install padding over entire floor area to be carpeted. Padding is not to be installed below carpet in public areas and in physically handicapped (PH) units.
- C. Installation of carpet in non-padded areas shall be by direct cement method in accordance with manufacturer's recommendations. Carpet installed over padding shall be secured with tackless strips.
- D. Cleaning – At completion of installation, remove dirt and debris from carpet, cut loose threads with sharp scissors, vacuum clean.

END OF SECTION 09 68 00

**SECTION 09 90 00 PAINTING****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

**1.2 SCOPE OF WORK**

- A. The extent of painting is shown on the drawings and the finish schedule.
- B. Items included but not limited to the following:
1. Prime and finish painting of:
    - Drywall
    - Doors and frames
    - Grilles, louvers and miscellaneous metals
    - Millwork and trim
    - Ceilings
  2. Interior caulking:
    - Exposed joints in corridors and ceilings. Also, perimeters of rooms, corridors, exterior walls and party walls. Refer to Section 07 92 00.
- C. Samples:

Color charts of the manufacturer selected for the different types of finishes to be used shall be furnished to the Owner for his use in selecting colors to be used in the building.

**PART 2 - PRODUCTS****2.1 MATERIALS**

- A. Manufacturers - All paint, varnish, stains, fillers and reducers shall be standard brands as made by the following manufacturers: Sherwin Williams, Pittsburgh Paint, Benjamin Moore, O'Leary Paint Co.

- B. All materials shall be of high quality and have identifying labels on the cans. Material shall be applicable for the surface on which it is to be applied as indicated in the Paint Schedule herein.
- C. The VOC (Volatile Organic Compound) content of painting and finishing products used shall not exceed those as determined by the U.S. Environmental Protection Agency (EPA) Reference Test Method 24 (Determination of Volatile Matter Content, Water Content Density Volume Solids and Weight Solids of Surface Coatings), Code of Federal Regulations Title 40, Part 60, Appendix A. The calculation of VOC shall exclude water and tinting color added at the point of sale. Maximum VOC level for interior coatings, VOC weight in grams per liter of product minus water, for non-flat products shall not exceed 50 and for flat products shall not exceed 50. Maximum VOC level for exterior coatings, VOC weight in grams per liter shall not exceed 200 for non-flat products and for flat products shall not exceed 100. Gloss readings shall be determined by ASTM D523-89, Standard Test Method for Specular Gloss.

Selection of colors shall be by the Architect.

- E. Interior caulking shall comply with ASTM specifications for interior latex caulks. Pecora Corp. (AC-20, Dynatrol), Tremco Acrylic latex. Use white stone or stone color.
- F. Wall and trim paints are to have washability and scrubability characteristics as follows:
  - 1. Washability – Soil is removed by Test Method 6141 of Federal Test Standard 141, without exposure of undercoat, more than 5% reduction of reflection, and without change of color as compared to the unwashed area.
  - 2. Scrubbability – Paint is not worn through when subjected to 400 strokes of ASTM test D-2486.
  - 3. Painting subcontractor shall submit manufacturer's printed information indicating conformance with the above listed standards to the Architect prior to the start of paint application.

## PART 3 - PRODUCTS

### 3.1 MATERIALS

- A. Preparation - Painting shall not be done in damp or rainy weather, or until surfaces have adequately dried.
- B. Surfaces shall be cleaned of dust, dirt, loose or excess mortar or concrete and holes and cracks shall be properly filled.

- C. Applications - Methods of applying materials, types of materials and amount of materials shall be as per manufacturer's recommendations and specifications for the type of surface on which it is to be applied and the intended service the finish is to provide.
- D. Finish Paint - Upon completion, all work shall be uniform, of approved color, smooth and free from runs, sags, defective brushing, clogging or excessive flooding. Edges of paint adjoining other colors or materials shall be sharp and clean without overlapping. Any defects or poor workmanship as described above as determined by the Architect shall be corrected by the Painting Contractor at no extra cost to the Owner.
- E. Painting Schedule:

Products as indicated in the schedule below shall be as manufactured by O'Leary Paint. Comparable products as manufactured by other acceptable manufacturers will be considered upon submittal to the Architect for review and approval.

1. Areas Designated to Receive Semi-Gloss Finish

- 1st coat - Drywall-ProPrime Hi-Hide Latex Wall Primer
- Metal-ProPrime Sunguard Metal Primer
- Wood-ProPrime Hi-Hide Latex Wall Primer
- Block- ProPrime Interior/Exterior Block
- 2nd coat - Prohide Interior Zero VOC Latex Semi-Gloss
- 3rd coat - Prohide interior Zero VOC Latex Semi-Gloss Enamel.

2. Drywall Designated to Receive Eggshell Finish

- 1st coat- ProPrime Hi-Hide Latex Wall Primer
- 2nd coat - ProHide Interior Zero VOC Latex Eggshell Wall Paint.
- 3rd coat - Prohide Interior Zero VOC Latex Eggshell Wall Paint.

3. Drywall Designated to receive Flat Finish

- 1st coat- Proprime Hi-Hide Latex Wall Primer
- 2nd coat-Prohide Interior Zero VOC Latex Flat Wall Paint.
- 3rd coat-Prohide Interior Zero VOC Latex Flat Wall Paint.

NOTE: All bathrooms, kitchens, laundry rooms and toilet rooms and shall receive semi-gloss enamel finish.

4. Wood Door Trim - Painted

- 1st coat-ProPrime Hi-Hide Latex Wall Primer
- 2nd coat-ProHide Interior Zero VOC Latex Semi-Gloss
- 3rd coat-ProHide Interior Zero VOC Latex Semi-Gloss

5. Metal – Interior not galvanized.  
  
1st coat – ProPrime Sunguard Metal Primer  
2nd coat – Prohide Interior Latex Semi-Gloss
  
6. Wood floors – Stain and varnished  
  
1st coat-Wood stain color  
2nd coat-Oil based Satin Sheen Varnish  
3<sup>rd</sup> coat- Oil based Satin Sheen Varnish
  
7. Exterior vents, stacks, etc. on roof, dryer vents, exposed exterior Piping:  
  
1st coat-ProPrime Sunguard Metal primer  
2nd coat-Duramax Latex Satin  
3rd coat-Duramax Latex Satin
  
8. Exterior Wood Trim  
  
1st coat-Sunguard Latex Satin  
2nd coat-Sunguard Latex Satin

F. GENERAL:

1. Access doors, electric breaker panels, registers, and grilles located in walls shall be painted same color as wall.
2. Before commencing work, remove hardware, accessories, plates and similar items that are not to be painted, or provide ample protection of such items. Re-install such items after completion of work in each space.
3. Wood doors, trim and floors to receive stain and varnish shall be sanded prior to staining, after staining and between varnish coats.
4. All duct work and studs visible through grilles or registers shall be painted black.
5. Exterior grilles, louvers, vent caps, vents through roof, etc. shall be painted to blend with adjacent surfaces.
6. Exposed piping shall generally be painted to match walls or ceilings adjacent to it.
7. Caulking and flashing, where visible shall be painted or pre-colored to match adjacent surface.

8. At completion of work, touch up and restore finish where damaged and leave in good condition. Paint top and bottom edges of wood doors one coat after fitting.

END OF SECTION 09 90 00

**SECTION 10 00 00 – MISCELLANEOUS EQUIPMENT****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

**1.2 SCOPE OF WORK**

- A. The extent of the miscellaneous equipment is indicated on the drawings and described herein.

**PART 2 - PRODUCTS****2.1 MATERIALS**

- A. Residence Unit Bath Accessories - The following accessories shall be provided in areas indicated on the drawings.

Medicine Cabinet – “Harmony” Model #G9926WBS1 Surface Mounted Medicine Cabinet, Size 16”x26”x4” by American Pride. [www.Apcabinets.com](http://www.Apcabinets.com)

Toilet Paper Holder – Basco #511, exposed screw mount.

Shower Rod – Basco #1212, length as required, 1” diameter, exposed screw mount.

Towel Bar – Basco #5524-24” long and #5518-18” long, exposed screw mount.

Mirror – 1/4” polished glass or mirror glazing quality, silvered for natural reflection and copper backed with edges clean cut and polished.

Grab Bars - Bradley 800 Series, 1-1/2" outside diameter 18 gauge type 304 stainless steel. Grab bars in wet areas shall have slip resistant finish. All grab bars shall be mounted to withstand a 300 pound hanging load.

Similar items as manufactured by Triangle or Taymor.

- B. Public Toilet Room Accessories - The following accessories shall be provided in areas indicated on the drawings.

Toilet Paper Holder - Bradley Model 505

Paper Towel Dispenser - Bradley Model 315-35, recessed with waste receptacle.

Soap Dispenser - Bradley Model 6562

Coat Hook - Bradley model 9154

Baby Changing Station - Bobrick KB310-SSWM

Mirror - Model 700, sizes as shown on drawings.

Grab bars as indicated on drawings, Bradley 800 series; 1-1/2" round outside diameter; 18 gauge type 304 stainless steel. Grab bars in wet areas shall have non-slip finish. All grab bars shall be mounted to withstand a 300-pound hanging load.

Similar items as manufactured by Bobrick, or Cweco.

- C. Identification Signage:

Provide formed plastic address number plaques with characters 4" high at each unit entry. Shape and colors of plaque shall be selected by the Architect.

Signs for identification of public rooms shall be of raised plastic. Letters shall be one inch high, with Helvetica Medium letters and shall be accompanied with Grade 2 Braille markings. Letters and numbers shall have a width-to-height ratio between 3:5 and 1:1 and a stroke width-to-height ratio between 1:5 and 1:10. Sign colors to be selected by the Architect. Signs shall be adhesively mounted on walls adjacent to the latch side of doors. Provide sample of sign for approval by the Architect. All signs shall be attached approximately 60 inches above floor level to the center of the sign.

Provide identification signage shall be of size and materials indicated on the Site Development drawings. An Equal Housing Opportunity logo and an International Barrier Free symbol shall be mounted on the project identification signs. Metal letters, numbers and logos shall be anodized aluminum, pin mounted to the sign plaque, color as selected by the Architect.

Provide metal signs for each parking space for the handicapped and van handicapped spaces. Signs shall be single faced model 218 (18" x 18") as manufactured by Charleston Industries, Inc. of Charleston, Mississippi.

- D. Events board-3'-0" x 5'-0" surface mounted corkboard with oak hardwood trim. Unit, as manufactured by Quartet Manufacturing Co., of Chicago, Illinois. Mount in FOYER OF Community building as directed by Owner.
- E. Mail Boxes – Provide and install Mail Boxes as shown on the Architectural Floor Plan. Boxes to be by Auth-Florence or Salisbury Industries and must meet USPS requirements. Units to be (6) Model 4C16D-15 boxes with 15 mail slots and 3 parcel lockers per unit.
- F. Laundry Rack shall be ventilated epoxy or plastic coated steel rod shelving, type 6605. Shelf shall be 15" deep. Support shelving at maximum of 18" on center. Manufacturer: Schulte Corp. Cincinnati, Ohio, Closet Maid or Clairon. Provide and install over all washers and dryers in Laundry Room.
- G. Fire Extinguishers and Cabinets: Where indicated on the drawings furnish J.L. Industries "Ambassador" series epoxy coated steel cabinets with full glass door, model #1017G with semi-recessed wall trim, door locks and break-glass tool. Fire extinguishers shall be J.L. Industries "Cosmic 10E", 10- pound ABC type.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

##### A. Handling

Deliver products to the General Contractor on the jobsite.

Store products on the site to prevent damage from vandalism, theft, and weather.

Protection:

1. Provide protective material on each item during shipping and handling.
2. Remove protective material when directed or at completion of the job.
3. Repair or remove and replace, items damaged during shipment or construction.

##### B. Installation

Install products in strict accordance with the manufacturer's written directions.

Fasten product securely to the structure using expansion bolts, lead inserts, screws or other means as recommended or required for each product.

C. Finish

Clean and adjust each product for proper operation to the Owner's satisfaction.

Touch-up paint finishes as directed.

**END OF SECTION 10 00 00**

**SECTION 11 00 00 – EQUIPMENT****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

**1.2 SCOPE OF WORK**

- A. Related work described in other Sections of the Specifications includes finish carpentry, garbage disposal units.
- B. Shop Drawings are required in accordance with the General Conditions. Do not commence fabrication of cabinets until reviewed shop drawings have been received from the Architect. Submit catalog cuts of appliances to be provided.

**PART 2 - PRODUCTS****2.1 CABINETS AND COUNTERTOPS**

- A. Kitchen and bathroom vanity cabinets shall be in traditional design as manufactured by Smart Cabinetry, Merillat Industries, Futura Cabinet Co. or Armstrong Cabinet Co. Kitchen and bathroom cabinets shall be equal to Smart “Brighton” cabinets, Shaker Door with Flat Panel Doors. Frames, ends and other exposed portions shall have low luster varnished finish. Colors to be selected by the Architect.
- B. Cabinet frames shall be of 13/16" select solid wood, with their joints doweled and glued. End panels shall be of 3-ply hardwood plywood. Doors and drawer fronts shall be solid wood. All doors and drawers shall have metal wire pull handles. Filler pieces, trim and scribe moldings, matching cabinet finishes shall be provided to close all gaps between cabinets and cabinets, between cabinets and walls and between cabinets and ceilings or soffits.
- C. Cabinet work shall meet the standards of NKCA and ANSI 161.1 and shall bear the seal of an independent inspection agency certifying compliance.

- D. Surfacing of countertops shall be plastic laminate surfacing in rolled edge or straight edge profile on core of particleboard conforming to U.S. Department of Commerce Commercial Standard CS-236-66 (type 2, grade B, Class 2) in 1-1/2" thickness, with 3/4" thick, 4" high backsplash. Provide side splashes at all walls adjacent to countertop. Exposed finishes shall be of "WilsonArt"4811-60 Titanium EV.
- E. Quartz Agglomerate Countertops in Toilet Rooms: Surfacing of countertops in Bathrooms to be Quartz Agglomerate material, see Finish Specifications.
1. Configuration: Provide countertops with the following front and backsplash style
  2. Front: Straight, slightly eased at top.
  3. Backsplash: Straight, slightly eased at corner.
  4. Endsplash: Matching backsplash.
  5. Countertops: 3 cm, Backsplashes: 1/2-inch- (12.7-mm).
  6. Fabrication: Fabricate tops in one piece with shop-applied edges and backsplashes unless otherwise indicated. Comply with quartz agglomerate manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
- F. Cultured Marble countertops in Unit Bathrooms to be one piece with integral bowl. See drawings for cabinetry sizes, field measure final installation and provide 1" overhang on all open sides. Color to be selected from Manufacturers full range.

## 2.2 APPLIANCES

- A. The following appliances shall be of the model numbers designated as manufactured by General Electric or equal products of Hotpoint. Refer to drawings for locations.
1. Refrigerator: Frost free General Electric Model GTE18DTNRWW , 17.5 cu.ft., Energy Star.
  2. Range: 30" free standing electric range, General Electric Model JBS160DMWW. Provide anti-tip hardware for all ranges.
  3. Range hood: General Electric Model JNM3163DJWW, 30" Microwave oven with recirculating fan and light.
    - a. Provide metal grease shields above and at the side of all ranges. Finish to be white baked enamel.
    - b. Provide and install 2 fire extinguisher canisters over range in all units.

4. Dishwasher: 24" General Electric Model GDF511PGRWW, Energy Star.
5. Refrigerator: (Community Room Kitchen and PH Units)  
General Electric Model GPE12FGKWW, frost free, 11.6 cu.ft., ADA compliant, Energy Star.
6. Range: (PH Units)  
General Electric Model JB480DMWW, self-cleaning, electric range. Provide anti-tip hardware for all ranges. Provide (2) fire canisters above each range.
7. Dishwasher:(Community Room Kitchen and PH Units)  
General Electric Model PDT145SGLWW, below counter, built-in, ADA compliant for height model, Energy Star.
10. Range hood: (PH Units) General Electric Model JVX3300DJWW, 30" recirculating/ventilating fan with light.
11. Microwave oven (PH Units and Community Room Kitchen)  
General Electric Model PCHK11S1WWW 1.1 Cu. Ft. Microwave oven with hanging kit for mounting under cabinets in Community Room. Countertop location in PH Units.

## **PART 3 - PRODUCTS**

### **3.1 INSTALLATION**

1. Install all appliances per manufacturer's written instructions.

**END OF SECTION 11 00 00**

**SECTION 12 21 00 – WINDOW BLINDS****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

**1.2 SCOPE OF WORK**

- A. Furnish and install window blinds for all exterior windows and sliding glass doors. Provide all necessary tracks, hardware and related accessories.

**PART 2 - PRODUCTS****2.1 MATERIALS**

- A. Horizontal Blinds, 1" slat style "CustoMizer" by Bali Contract or similar product by Levelor or Graber. Provide with all required components, including but not limited to head channel, headrail, tilting control, cord lock, drum and cradles, tilt rod and brace, braided ladders, factory prefinished aluminum slats, bottom rail, intermediate brackets and installation brackets. Colors shall be as selected by the Architect from manufacturer's standard range.

**PART 3 - EXECUTION****3.1 INSTALLATION**

- A. Installer shall field measure all openings to receive window blinds. Installation shall be as per blind manufacturer's printed instructions. All brackets shall be screw mounted through finish wall materials into wood blocking provided by carpentry subcontractor.

**END OF SECTION 12 21 00**

**SECTION 14 21 00 – TRACTION ELEVATOR****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 SECTION INCLUDES**

- A. Electric traction passenger elevator.

**1.3 SUBMITTALS**

- A. Product Data: Submit manufacturer/installer's product data, including,
  - 1. Descriptive brochures or detail drawings of car and hall fixtures, cab ceilings, and product features.
  - 2. Power Information: Horsepower, starting current, running current, machine and control heat release, and electrical requirements.
- B. Shop Drawings: Submit manufacturer/installer's shop drawings, including plans, elevations, sections, and details, indicating location of equipment, loads, dimensions, tolerances, materials, components, fabrication, fasteners, hardware, finish, options, accessories, and other information to render totally functional elevators.
- C. Samples: Submit manufacturer/installer's samples of standard colors and finishes of finish materials.
- D. Operation and Maintenance Manual: Submit manufacturer/installer's operation and maintenance manual; including operation, maintenance, adjustment, and cleaning instructions; trouble shooting guide; renewal parts catalogs; and electrical wiring diagrams.
- E. Warranty: Submit manufacturer/installer's standard warranty.

**1.4 QUALITY ASSURANCE**

- A. Manufacturer/Installer's Qualifications: Specialize in manufacturing and installing elevator equipment, with a minimum of 10 years successful experience.

**B. Regulatory Requirements:**

1. Elevator design, clearances, construction, workmanship, materials, and installation, unless specified otherwise, shall be in accordance with ANSI/ASME A17.1, handicap accessibility, Americans with Disabilities Act, and other codes having legal jurisdiction.
2. ANSI/ASME A17.1 shall govern, except where codes having legal jurisdiction include more rigid requirements or conflict with ANSI/ASME A17.1.
3. Elevator shall follow design and manufacturing procedures certified in accordance with ISO 9001-2000 to meet product and service requirements for quality assurance for new products.
4. Where product is in variance to the published ANSI/ASME A17.1 model code, provide a 3rd party AECO certification demonstrating equivalent function, safety, and performance.

**C. Pre-installation Meeting:**

1. Convene pre-installation meeting before start of installation of elevators.
2. Require attendance of parties directly affecting work of this section, including Contractor, Architect, and elevator manufacturer/installer.
3. Review examination, installation, field quality control, adjusting, cleaning, protection, and coordination with other work.

**1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Delivery: Deliver materials to site in manufacturer/installer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer/installer.
- B. Storage: Store materials in clean, dry area indoors in accordance with manufacturer/installer's instructions.
- C. Handling: Protect materials during handling and installation to prevent damage.

**1.6 PROJECT CONDITIONS****A. Temporary Electrical Power:**

1. Owner will arrange for temporary 220 VAC, single-phase, 60 Hz., GFCI-protected electricity to be available for installation of elevator components.
2. Comply with Section 01 50 00 – Temporary Utilities.

**B. Installation of the Elevator:**

1. General Contractor will provide permanent three-phase power prior to installation start.

2. General Contractor will provide clear, rollable access to a 20' x 10' secure and dry storage area prior to delivery.
  3. General Contractor will provide a clean, dry, and complete hoistway along with temporary installation platform and all required OSHA-compliant barricades prior to delivery.
- C. Temporary Use of Elevator:
1. Owner will negotiate with manufacturer/installer for temporary use of elevator, if required.
  2. Temporary use of elevator shall be in accordance with terms and conditions of manufacturer/installer's temporary acceptance form.

## 1.7 WARRANTY

- A. Manufacturer/installer shall guarantee materials and workmanship of equipment installed under these specifications and make good, defects not due to ordinary wear or to improper use, which may develop within 1 year after completion of installation or acceptance thereof by beneficial use, whichever is earlier.

## 1.8 MAINTENANCE SERVICE

- A. Elevator maintenance service shall be performed by elevator manufacturer/installer.
- B. Elevators shall receive regular maintenance on each unit for period of 12 months after completion of work specified herein or acceptance thereof by beneficial use, whichever is earlier.
- C. Elevator Control System:
1. Include built-in remote diagnostic module to relay constant status of elevators and control system to a 24-hour, 7-days-a-week central-monitoring facility.
  2. Remote Monitoring Device: Transmit information on current status of elevators, including malfunctions, system errors, and shutdown.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURER/INSTALLER

- A. Otis Elevator Corporation, Website [www.otis.com](http://www.otis.com).
- B. Elevator shall be installed by elevator manufacturer.

## 2.2 ELEVATOR SYSTEM AND COMPONENTS

- A. Electric Traction Passenger Elevators: Basis of design is the Otis Gen 3 3500R Traction Elevator.
- B. Elevator Equipment Summary:
1. Application: Machine Room Less (MRL)
  2. Counterweight Location: Side
  3. Machine Location: Top of the hoistway mounted on car and counterweight guide rails
  4. Control Space Location: Top landing entrance frame or entrance frame at one floor below the top landing
  5. Service: General Purpose Passenger
  6. Quantity: 1 Unit
  7. Capacity: 3500 lbs
  8. Speed: 150 fpm
  9. Travel: 34'-8"
  10. Landings: 6
  11. Front Openings: 2
  12. Rear Openings: 4
  13. Operation: Microprocessor Single Car Automatic Operation
  14. Clear Inside Dimensions: 8'-6" Wide x 7'-5 1/4" Deep
  15. Cab Height: 7' 9"
  16. Guide Rails: Equivalent to 12 lb. per foot
  17. Entrance Type and Width: Single Speed Side Opening doors
  18. Entrance Height: 7'-0"
  19. Power Supply: 208 Volts 3 Phase 60 Hz
- C. Performance:
1. Car Speed: -10% to +5% of contract speed under any loading condition or direction of travel.
  2. Car Capacity: Safely lower, stop and hold up to 125% of rated load per code.
- D. Ride Quality:
1. Vertical Vibration (maximum): 25 mg
  2. Horizontal Vibration (maximum): 15 mg
  3. Vertical Jerk (maximum): 2 ft/sec<sup>3</sup>
  4. Acceleration (maximum): 1.6 ft/sec<sup>2</sup>
  5. In Car Noise: 53-60 dB(A)
  6. Stopping Accuracy: ±5mm
  7. Starts per hour (maximum): 180

## E. Elevator Operation:

1. Simplex Collective Operation: Using a microprocessor based controller, operation shall be automatic by means of the car and hall buttons. When all calls have been answered, the car shall park at the last landing served.
2. Group Automatic Operation with Demand-Based Dispatching: Provide reprogrammable group automatic system that assigns cars to hall calls based on a dispatching algorithm designed to minimize passenger waiting time.

## F. Operating Features - Standard:

1. Door Light Curtain Protection
2. Static AC Drive
3. Phase Monitor Relay
4. Cab Overload with Indicator
5. Load-weighing
6. Central Alarm
7. Remote Monitoring
8. Firefighter's Operation
9. Automatic Evacuation
10. When the main line power is lost for longer than 5 seconds the emergency battery power supply provides power automatically to the elevator controller. If the car is at a floor when the power fails, it remains at that floor, opens its doors, and shuts down. If the car is between floors, it is raised or lowered to the first available landing, opens its doors, and shuts down.
11. Independent Service

## G. Operating Features - Optional: Battery Backup operated emergency return unit.

**2.3 EQUIPMENT: CONTROL COMPONENTS AND CONTROL SPACE**

## A. Controller: Provide microprocessor based control system to perform all of the functions of safe elevator operation, as well as perform car and group operational control.

1. All high voltage (110v or above) contact points inside the inspection and test panel shall be protected from accidental contact in a situation where the access panels are open.
2. The controller shall be distributed throughout the elevator system located in the overhead, cab and inspection and test panel. The inverter will be mounted in the overhead adjacent to the hoist machine and an inspection and test panel will be located in the door jamb at the top floor or one floor below the top floor. No elevator equipment mechanical rooms or closets are required.
3. Provide multi-bus control architecture to reduce cabling, material and waste.

- B. Drive: Provide a Variable Voltage Variable Frequency AC Closed Loop drive system. Provide stable start without high peak current, quickly reaching a low energy consumption level.
- C. Inspection and Test Panel: Integrated control equipment, main inspection and test panel in door frame at top level served or at one floor below the top level served.

## 2.4 EQUIPMENT: HOISTWAY COMPONENTS

- A. Machine:
  - 1. Gearless asynchronous AC motor with integral drive sheave, service and emergency brakes.
  - 2. Design machine to enable direct power transfer, thereby avoiding loss of power.
  - 3. Design machine to be compact, lightweight and durable to optimize material usage and save space.
  - 4. Mount to structural support channels on top of guide rail system as applicable in hoistway overhead.
- B. Governor:
  - 1. Tension type over-speed governor with remote manual reset.
  - 2. Mount to structural support channels as applicable in hoistway overhead.
- C. Buffers, Car and Counterweight: Compression spring type buffers to meet code.
- D. Hoistway Operating Devices:
  - 1. Emergency Stop switch in the pit.
  - 2. Terminal stopping switches.
  - 3. Emergency stop switch on the machine.
- E. Positioning System: System consisting of proximity sensors and door zone vanes.
- F. Guide Rails and Attachments: Provide Tee-section steel rails with brackets and fasteners. Side counterweight arrangements shall have a dual purpose bracket that combines both counterweight guide rails, and one of the car guide rails to building fastening.
- G. Suspension System: Non circular Elastomeric coated suspension media with high tensile grade steel cords.

## 2.5 EQUIPMENT: HOISTWAY ENTRANCES

- A. Hoistway Doors and Frames:
  - 1. UL rated with required fire rating.
  - 2. Doors: Rigid flush panel construction with reinforcement ribs.
  - 3. Frames: Securely fasten at corners to form unit frame. Frames shall be bolted.

- B. Finish:
  - 1. Exposed Areas of Corridor Frames: Painted Primer - All Floors
  - 2. Doors: Painted Primer - All Floors
  - 3. Sills: Aluminum - All Floors
  
- C. Entrance Markings and Jamb Plates: Provide standard entrance jamb tactile markings on both jambs, at all floors. Plate Mounting: Refer to manufacturer drawings.

## 2.6 EQUIPMENT: CAR COMPONENTS

- A. Car Frame and Safety: Provide car frame with adequate bracing to support the platform and car enclosure. The safety shall be integral to the car frame and shall be flexible guide clamp type.
  
- B. Platform: Provide platform of steel construction with plywood subfloor and aluminum threshold.
  
- C. Car Guides: Provide sliding guide shoes mounted to top and bottom of both car and counterweight frame. Arrange each guide shoe assembly to maintain constant contact on the rail surfaces. Provide retainers in areas with Seismic design requirements.
  
- D. Provide central guiding system to reduce mechanical friction and energy consumption.
  
- E. Steel Cab:
  - 1. Fire rating: Provide Class B fire rating for cab, or Class A fire rating where required by local Code.
  - 2. Design cab to comply with LEED Indoor Environmental Quality requirements through use of Low-Emitting Materials on walls, ceiling and subflooring.
  - 3. Car wall finish: Painted Primer selected from manufacturer's standard selections.
  - 4. Base and frieze: Aluminum.
  - 5. Car front finish: Brushed stainless steel.
  - 6. Car door finish: Brushed stainless steel.
  - 7. Ceiling: Canopy ceiling, finished in #4 Stainless Steel With Down Lit Led Lighting. Provide lighting consisting of four LED lights on the cab ceiling.
  - 8. Handrail: 1 3/8" Round and Curved Painted Aluminum. Locate on Side Walls.
  - 9. Flooring: By others. Not to exceed 3/8" finished depth.
  - 10. Ventilation: Provide one-speed fan in canopy.
  - 11. Emergency Car Lighting: Provide an emergency power unit employing a 12 volt sealed rechargeable battery and static circuits to illuminate the elevator car and provide current to the alarm bell in the event of building power failure.
  - 12. Emergency Siren: Provide siren mounted on top of the car that is activated when the Alarm button in the car operating panel is engaged.

13. Emergency Exit Switch: Provide an electrical contact to open the safety circuit when the emergency car top exit is opened. When the exit door is opened, the top exit switch shall signal the control and the car will be unable to move.
14. Emergency Exit Lock: Provide an emergency exit lock where required by local code.
15. Emergency Exit Guard: Provide emergency exit guard on top of car when required for hoistway wall to platform clearance exceeds 12" or for multiple cars in hoistway.

## 2.7 DOOR OPERATOR AND REOPENING DEVICES

- A. Door Operator: Provide a closed loop VVVF high performance door operator with frequency controlled drive for fast and reliable operation to open and close the car and hoistway doors simultaneously.
- B. In case of interruption or failure of electric power, the doors can be readily opened by hand from within the car, in accordance with applicable code. Provide emergency devices and keys for opening doors from the landing as required by local code.
- C. Doors shall open automatically when the car has arrived at or is leveling at the respective landings. Doors shall close after a predetermined time interval or immediately upon pressing of a car button. Provide door open button in the car operating panel. Momentary pressing of this button shall reopen the doors and reset the time interval.
- D. Provide door hangers and tracks for each car and hoistway door. Contour tracks to match the hanger sheaves. Design hangers for power operation with provisions for vertical and lateral adjustment. Hanger sheaves shall have polyurethane tires and pre-lubricated sealed for life bearings.
- E. Electronic Door Safety Device: Equip car doors with concealed transmitter and receiver infrared beam devices to detect presence of object in process of passing through hoistway entrance and car doorway (light curtain device).
  1. Use multi-beam scanning without moving parts to detect obstructions in door opening.
  2. Detector Device: Prevent doors from closing, or if they have already started closing, cause doors to reopen and remain open while object is within detection zone.
  3. Horizontal Beams: Minimum of 33 infra red beams to fill doorway from ground level to a height of 6 feet.

**2.8 EQUIPMENT: SIGNAL DEVICES AND FIXTURES**

- A. Car Operating Panel: Provide a car operating panel with all push buttons, key switches and message indicators for elevator operation.
1. Full height car operating panel shall be surface-mounted on front return.
  2. Comply with handicap requirements.
  3. Push Buttons: Mechanical, illuminating using long-lasting LEDs for each floor served.
  4. Emergency Buttons: Provide in accordance with code. Emergency alarm button, door open and door close buttons.
- B. Features of the Car Operating Panel Shall Include:
1. Audible chime to signal that the car is either stopping at or passing a floor served by the elevator.
  2. Raised markings and Braille provided to the left hand side of each push button.
  3. Car Lantern: Provide LED illuminated car lantern with direction arrows to comply with local code when hall lanterns are not provided.
  4. Door open and close push buttons.
  5. Firefighter's hat and Phase 2 Key-switch
  6. Inspection key-switch.
  7. Key-switch for optional Independent Service Operation
  8. Illuminated alarm button with raised marking.
  9. Elevator Data Plate marked with elevator capacity and car number.
  10. Help Button: Activation of help button will initiate two-way communication between car and a location inside the building, switching over to alternate location if call is unanswered, where personnel are available to take the appropriate action. Visual indicators are provided for call initiation and call acknowledgement.
- C. Hall Fixtures: Provide hall fixtures with necessary push buttons and key switches for elevator operation.
1. Push buttons: Metallic tactile push buttons, up button and down button at intermediate floors, single button at each terminal floor.
  2. Height: Comply with handicap requirements.
  3. Illumination: Illuminating using long-lasting low power LEDs.
- D. Hall Lanterns and Position Indicators.
1. LED illuminated direction arrows with audible and visible call acknowledgement.
- E. Hoistway access switches: Provide key-switch at top and/or bottom floor in entrance jamb as required by local code.
- F. Firefighter's Phase 1 Service: Key switch in brushed stainless steel cover plate.

- G. Fixture Cover Plates: For push buttons, hall lanterns and position indicators, resistant white back-printed glass, no screws required for mounting. Provide stainless steel cover plates for Firefighter's Phase I switch and hoistway access switches, with tamper resistant screws in same finish.
- H. Mounting: Mount hall fixtures in entrance frames.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Examine hoistways, hoistway openings, and pits before starting elevator installation.
- B. Verify hoistway, pit, overhead, and openings are of correct size, within tolerances, and are ready for work of this section.
- C. Verify walls are plumb where openings occur and ready for entrance sill installation. Traditional sill angle or concrete sill support shall not be required.
- D. Verify hoistway is clear and plumb, with variations not to exceed -0 to +1 inch at any point. Verify projections greater than 4" must be beveled not less than 75 degrees from horizontal. No negative tolerance is permitted for minimum hoistway dimensions.
- E. Verify minimum 2-hour fire-resistance rating of hatch walls.
- F. Notify Architect in writing of dimensional discrepancies or other conditions detrimental to proper installation or performance of elevators.
- G. Do not proceed with elevator installation until unsatisfactory conditions have been corrected in a manner acceptable to manufacturer/installer.

### **3.2 INSTALLATION**

- A. Install elevators in accordance with manufacturer/installer's instructions and ANSI/ASME A17.1.
- B. Set entrances in vertical alignment with car openings, and aligned with plumb hoistway lines.

### **3.3 FIELD QUALITY CONTROL**

- A. Perform tests of elevator as required by ANSI/ASME A17.1 and governing codes.

**3.4 ADJUSTING**

- A. Adjust elevators for proper operation in accordance with manufacturer/installer's instructions.
- B. Adjust elevators for smooth acceleration and deceleration of car so not to cause passenger discomfort.
- C. Adjust doors to prevent opening of doors at landing on corridor side, unless car is at rest at that landing, or is in leveling zone and stopping at that landing.
- D. Adjust automatic floor leveling feature at each floor to within 1/4 inch of landing.
- E. Repair minor damages to finish in accordance with manufacturer/installer's instructions and as approved by Architect.
- F. Remove and replace damaged components that cannot be successfully repaired as determined by Architect.

**3.5 CLEANING**

- A. Clean elevators promptly after installation in accordance with manufacturer/installer's instructions.
- B. Do not use harsh cleaning materials or methods that could damage finish.

**3.6 PROTECTION**

- A. Protect installed elevators from damage during construction in accordance with the negotiated temporary use agreement between Owner and manufacturer's installer.

**END OF SECTION 14 21 10**

**SECTION 14 91 82 - TRASH CHUTES****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. Waste chutes.

**1.3 ACTION SUBMITTALS**

- A. Shop Drawings:
  - 1. Include plans, elevations, sections, and mounting and attachment details.
  - 2. Include dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 3. Include each type and location of intake, discharge, and access door.
  - 4. Include diagrams for power, signal and control wiring.

**1.4 INFORMATIONAL SUBMITTALS**

- A. Coordination Drawings: Plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
  - 1. Size and construction of chase enclosing each chute; locations for power, signal, and control wiring; and sprinkler-piping and water-service connections.
  - 2. Chute-discharge locations coordinated with compactor-intake or container locations.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. American Chute Systems, Inc.
  2. U.S. Chutes; U.S.C. Group.
  3. Wilkinson Hi-Rise, LLC.
  4. Substitutions per 01 25 00

### 2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing and inspecting agency, for fire-protection ratings indicated.
1. Test Pressure: Test at atmospheric (neutral) pressure according to NFPA 252 or UL 10B.
  2. Intake Doors: Labeled, 1-1/2-hour fire-resistance rated with 30-minute temperature rise of 250 deg F.
  3. Access Doors: Labeled, 1-1/2-hour fire-resistance rated with 30-minute temperature rise of 250 deg F.
- B. Discharge-Door Assemblies: Fire-resistive door construction according to NFPA 252 or UL 10B requirements for fire-rated door assemblies.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Standard: Provide chutes complying with NFPA 82.

### 2.3 CHUTES

- A. Chute Metal: Aluminum-coated, cold-rolled, commercial steel sheet; ASTM A 463/A 463M, Type 1, with not less than T1-40 coating.
1. Thickness: 0.060 inch .
- B. Chute Size: 24-inch diameter.

## 2.4 DOORS

- A. Intake-Door Assemblies: ASTM A 240/A 240M, Type 304, stainless-steel self-closing units with positive latch and latch handle, with stainless-steel trim; constructed as required for performance requirements indicated; and with frame suitable for the enclosing chase construction.
  - 1. Door Type: Hopper.
  - 2. Size: Manufacturer's standard size for door type, chute type, and diameter indicated.
  - 3. Finish: Manufacturer's standard satin or No. 3 directional polish.
  - 4. Latchset: Lever-handle type that unlatches door.
- B. Discharge-Door Assemblies: Aluminum-coated steel; direct vertical-discharge type, inclined, and horizontally closing and latching; constructed as required for performance requirements indicated; and equipped with 165 deg F fusible links that cause doors to close in the event of fire.
- C. Detector System: Heat-and smoke-detecting interlock system with temperature-rise elements that locks chute doors when temperature in chute reaches a predetermined, adjustable temperature.
  - 1. Locate smoke detector outside discharge door with solenoid to close discharge door.
- D. Manual Control System: Control system with manual switch that lock chute doors during shutdown hours and service operations.

## 2.5 ACCESSORIES

- A. Chute Fire Sprinklers: NFPA 13; manufacturer's standard, recessed, automatic, NPS 1/2 sprinklers; ready for piping connections.
- B. Flushing Spray Unit: NPS 3/4 spray-head unit located in chute above highest intake door, ready for hot-water piping connection, and with access door for spray-head and piping maintenance.
- C. Sanitizing Unit: NPS 3/4 disinfecting and sanitizing spray-head unit located in chute above highest intake door, including 1-gal. tank and adjustable proportioning valve with bypass for manual control of sanitizing and flushing operation, ready for hot-water piping connection, and with access door for spray-head and piping maintenance.
- D. Sound Dampening: Manufacturer's standard sound-deadening coating on exterior of chute.

## 2.6 FABRICATION

- A. General: Factory-assemble chutes to greatest extent practicable with nonleaking, continuously welded or lock-seamed joints without bolts, rivets, or clips projecting into chute interior. Include intake-door assemblies, metal supporting framing at each floor, and chute expansion joints between each support point.
- B. Roof Vent: Fabricate vent unit as full-size extension of chute, open to the atmosphere. Extend vent to height above roofing surface as indicated on Drawings. Equip vent with full insect screening and metal explosion-release cap. Fabricate with roof-deck flange, counterflashing, and clamping ring of nonferrous metal compatible with chute metal.
- C. Chute Fire Sprinklers: Install internally within chute, recessed out of the chute area through which material travels, and according to NFPA 13. Locate fire sprinklers at or above the top service opening of chutes, within the chute at alternate floor levels in buildings more than two stories tall, and at the lowest service level.
- D. Equipment Access: Fabricate chutes with access for maintaining equipment located within the chute, such as flushing and sanitizing units, fire sprinklers, and plumbing and electrical connections.

## 2.7 TRASH BINS

- A. Provide with (8) 95 Gallon trash bins, Uline Utility Tilt Truck or equal, Model #H-7938G.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install and test chutes before installing enclosing chase construction.
- B. Install chutes according to NFPA 82 and manufacturer's written instructions. Assemble components with tight, nonleaking joints. Anchor chutes securely to supporting structure to withstand impacts and stresses. Install chute and components to maintain fire-resistive performance of chute and the enclosing chase construction.
- C. Install chutes plumb, without obstructions that might prevent materials from free falling within chutes.
- D. Anchor flanges of chute vents to roof curbs before installing roofing and flashing. Install chute-vent counterflashing after roofing and roof-penetration flashing are installed.

- E. Intake and Discharge Doors: Interface door units with throat sections of chutes for safe, snag-resistant, sanitary depositing of materials in chutes.
  - 1. Interconnect sanitizer control with door interlock system.
- F. Test and adjust chute components after installation. Operate doors, locks, and interlock systems to demonstrate that hardware operates properly and smoothly and electrical wiring is connected correctly.
- G. Test heat-and smoke-sensing devices for proper operation.
- H. Operate sanitizing unit through one complete cycle of chute use and cleanup, and replenish chemicals or cleaning fluids in unit containers.

### 3.2 CLEANING

- A. After completing chase enclosure, clean exposed surfaces of chute system's components. Do not remove labels of testing and inspecting agencies.

### 3.3 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain each chute and related equipment.
- B. Demonstrate replenishment of sanitizing-unit chemicals or cleaning fluids.

**END OF SECTION 14 91 82**

**SECTION 220516**  
**EXPANSION FITTINGS AND LOOPS FOR PLUMBING PIPING**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Flexible pipe connectors.
- B. Expansion joints and compensators.

**1.02 REFERENCE STANDARDS**

- A. EJMA (STDS) - EJMA Standards; Tenth Edition.
- B. UL (DIR) - Online Certifications Directory; Current Edition.

**1.03 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data:
  - 1. Flexible Pipe Connectors: Indicate maximum temperature and pressure rating, face-to-face length, live length, hose wall thickness, hose convolutions per foot (meter) and per assembly, fundamental frequency of assembly, braid structure, and total number of wires in braid.
  - 2. Expansion Joints: Indicate maximum temperature and pressure rating, and maximum expansion compensation.
- C. Maintenance Data: Include adjustment instructions.
- D. Project Record Documents: Record installed locations of flexible pipe connectors, expansion joints, anchors, and guides.

**PART 2 PRODUCTS****2.01 REGULATORY REQUIREMENTS**

- A. Comply with UL (DIR) requirements.

**2.02 FLEXIBLE PIPE CONNECTORS - COPPER PIPING**

- A. Manufacturers:
  - 1. Mercer Rubber Company; \_\_\_\_\_: [www.mercer-rubber.com/#sle](http://www.mercer-rubber.com/#sle).
  - 2. The Metraflex Company; \_\_\_\_\_: [www.metraflex.com/#sle](http://www.metraflex.com/#sle).
  - 3. Unisource Manufacturing, Inc; Series 411, Bronze Braided Flex Connectors: [www.unisource-mfg.com/#sle](http://www.unisource-mfg.com/#sle).
  - 4. Substitutions: See Section 016000 - Product Requirements.
- B. Inner Hose: Bronze.
- C. Maximum Service Temperature: 450 degrees F (232 degrees C).
- D. Size: Use pipe sized units.
- E. Application: Copper piping.

### 2.03 EXPANSION JOINTS - COMPENSATORS

- A. Manufacturers:
  - 1. Flex-Hose Co. Inc; \_\_\_\_: [www.flexhose.com/#sle](http://www.flexhose.com/#sle).
  - 2. Unisource Manufacturing, Inc; Series 416, Expansion Compensators: [www.unisource-mfg.com/#sle](http://www.unisource-mfg.com/#sle).
  - 3. Substitutions: See Section 016000 - Product Requirements.
- B. Type: Two-ply 304 stainless steel bellows with carbon steel shroud.
- C. Maximum Working Pressure: 200 psi (1378.9 kPa).
- D. Maximum Working Temperature: 400 degrees F (205 degrees C).
- E. Maximum Compression: 1/2 inch (12.7 mm).
- F. Maximum Extension: 5/32 inch (4.0 mm).
- G. End Connections: Female copper sweat.
- H. Application: Copper piping up to 3 inches (75 mm, DN) in size or steel piping up to 4 inches (100 mm, DN) in size.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with EJMA (Expansion Joint Manufacturers Association) Standards.
- C. Install flexible pipe connectors on pipes connected to vibration isolated equipment. Provide line size flexible connectors.
- D. Anchor pipe to building structure where indicated. Provide pipe guides so movement is directed along axis of pipe only. Erect piping such that strain and weight is not on cast connections or apparatus.
- E. 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 220516**

**SECTION 220517**  
**SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Pipe sleeves.
- B. Pipe sleeve-seals.

**1.02 RELATED REQUIREMENTS**

- A. Section 078400 - Firestopping.
- B. Section 099113 - Exterior Painting: Preparation and painting of exterior piping systems.
- C. Section 099123 - Interior Painting: Preparation and painting of interior piping systems.
- D. Section 220523 - General-Duty Valves for Plumbing Piping.
- E. Section 220553 - Identification for Plumbing Piping and Equipment: Piping identification.
- F. Section 220719 - Plumbing Piping Insulation.

**1.03 REFERENCE STANDARDS**

- A. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type); 2022a.
- B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2023a.
- C. UL (DIR) - Online Certifications Directory; Current Edition.

**1.04 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.
- C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 016000 - Product Requirements, for additional provisions.

**1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified this section.
- 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.

## 1.06 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.

## 1.07 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

## PART 2 PRODUCTS

### 2.01 PIPE SLEEVES

- A. Vertical Piping:
  - 1. Sleeve Length: 1 inch (25 mm) above finished floor.
  - 2. Provide sealant for watertight joint.
- B. 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.
- C. Clearances:
  - 1. Provide allowance for insulated piping.
  - 2. Wall, 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.

### 2.02 PIPE-SLEEVE SEALS

- A. Modular Mechanical Sleeve-Seal:
  - 1. Elastomer-based interlocking links continuously fill annular space between pipe and wall-sleeve, wall or casing opening.
  - 2. Watertight seal between pipe and wall-sleeve, wall or casing opening.
  - 3. Size and select seal component materials in accordance with service requirements.
  - 4. Service Requirements:
    - a. Corrosion resistant.
    - b. Underground, buried, and wet conditions.
    - c. Fire Resistant: 1 hour, UL (DIR) approved.
  - 5. Glass-reinforced plastic pressure end plates.
- B. Sealing Compounds:
  - 1. Provide packing and sealing compound to fill pipe to sleeve thickness.
  - 2. Combined packing and sealing compounding to match partition fire-resistance hourly rating.
- C. Pipe Sleeve Material:
  - 1. Bearing Walls: Steel, cast iron, or terra-cotta pipe.

2. Masonry Structures: Sheet metal or fiber.

D. Wall Sleeve: PVC material with waterstop collar, and nailer end-caps.

### **PART 3 EXECUTION**

#### **3.01 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.

#### **3.02 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. 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. Pack solid using mineral fiber complying with 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.

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.

E. 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.

- F. 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.

### **3.03 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 220517**

**SECTION 220519**  
**METERS AND GAUGES FOR PLUMBING PIPING**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Pressure gauges.
- B. Thermometers.
- C. Pressure-temperature test plugs.

**1.02 REFERENCE STANDARDS**

- A. ASME B40.100 - Pressure Gauges and Gauge Attachments; 2022.
- B. ASTM E1 - Standard Specification for ASTM Liquid-in-Glass Thermometers; 2014 (Reapproved 2020).
- C. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers; 2014 (Reapproved 2021).
- D. AWWA M6 - Water Meters -- Selection, Installation, Testing, and Maintenance; 2012, with Addendum (2018).

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Utility Service Metering: Coordinate and apply Utility Service Provider requirements in terms of meter type, size, physical location, pipe size, upstream/downstream pipe lengths required, and other installation details.

**1.04 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide red-marked product data sheets for each furnished item with associated components and accessories.
- C. Project Record Documents: Record actual locations of components and instrumentation.

**PART 2 PRODUCTS****2.01 PRESSURE GAUGES**

- A. Bourdon Tube for Liquids and Gases:
  - 1. Accuracy: ASME B40.100, adjustable commercial grade (D) with 5 percent of span.
  - 2. Process Connection: Lower-back, 1/4 inch (8 mm, DN) NPT male except where noted.

**2.02 THERMOMETERS**

- A. General:
  - 1. Product Compliance: ASTM E1.
  - 2. Lens: Clear glass, except where stated.

3. Accuracy: One percent, when tested in accordance with ASTM E77, except where stated.
  4. Scale: Black markings depicting single scale in degrees F where expected process value falls half-span of standard temperature range.
- B. Thermometers - Adjustable Angle: 7 inch (177.8 mm) v-shape aluminum case with clear glass window scale, 6 inch (152.4 mm) NPT stem, red or blue organic non-toxic liquid filled glass tube, and adjustable joint with positive locking device allowing 360 degrees in horizontal plane or 180 degrees in vertical plane adjustments.
- C. Thermometers - Dial Type:
1. Fixed: 5 inch (125 mm) diameter dial with black pointer, stainless steel case, silicone damping bimetal element, hermetically sealed lens, recalibrating screw, and 2-1/2 inch (63.5 mm) NPT stem.
  2. Adjustable Angle: 5 inch (125 mm) diameter dial with black pointer, stainless steel case, silicone damping bimetal element, hermetically sealed lens, recalibrating screw, and 2-1/2 inch (63.5 mm) NPT stem.

### **2.03 PRESSURE-TEMPERATURE TEST PLUGS:**

- A. Size: 500 psi (34.5 bar) capacity; 1/2 inch (13 mm) MPT brass fitting with gasket, cap, and retaining strap for 1/8 inch (3 mm) pressure gauge or temperature probe.
- B. Wetted Materials per Temperature Range:
1. Up to 200 degrees F (93 degrees C): Brass probe with neoprene core.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports, and test plugs.

### **3.02 INSTALLATION**

- A. Install metering products in accordance with manufacturer's instructions for intended fluid type and service.
- B. Install water meters with inlet and outlet isolation valves in compliance with AWWA M6.
- C. Install pressure gauges as follows:
1. At Pumps: Place single gauge before strainer, suction side and discharge side.
  2. Include gauge cock to isolate each gauge and extend nipples for insulation clearance.
  3. Adjust gauges to selected viewing angle, clean thoroughly, and calibrate to zero.
- D. Install thermometers as follows:
1. Hot Water Heaters: Place upstream and downstream of heater.
- E. Locate PT (pressure-temperature) test plugs adjacent to control device sockets.

**END OF SECTION 220519**

**SECTION 220523  
GENERAL-DUTY VALVES FOR PLUMBING PIPING**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Ball valves.
- B. Butterfly valves.
- C. Check valves.
- D. Thermostatic Balancing Valves.

**1.02 ABBREVIATIONS AND ACRONYMS**

- A. CWP: Cold working pressure.
- B. EPDM: Ethylene propylene copolymer rubber.
- C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.
- D. NRS: Non-rising stem.
- E. OS&Y: Outside screw and yoke.
- F. PTFE: Polytetrafluoroethylene.
- G. RS: Rising stem.
- H. TFE: Tetrafluoroethylene.
- I. WOG: Water, oil, and gas.

**1.03 REFERENCE STANDARDS**

- A. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.
- B. ASME B31.9 - Building Services Piping; 2020.
- C. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings; 2004 (Reapproved 2023).
- D. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings; 2017.
- E. MSS SP-71 - Gray Iron Swing Check Valves, Flanged and Threaded Ends; 2018.
- F. MSS SP-80 - Bronze Gate, Globe, Angle, and Check Valves; 2019.
- G. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010, with Errata .
- H. NSF 61 - Drinking Water System Components - Health Effects; 2024.
- I. NSF 372 - Drinking Water System Components - Lead Content; 2024.

**1.04 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittal procedures.

- B. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.
- C. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts listings.

### 1.05 QUALITY ASSURANCE

- A. Manufacturer:
  - 1. Obtain valves for each valve type from single manufacturer.
  - 2. Company must specialize in manufacturing products specified in this section, with not less than three years of documented experience.

### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Use the following precautions during storage:
  - 1. Maintain valve end protection and protect flanges and specialties from dirt.
    - a. Provide temporary inlet and outlet caps.
    - b. Maintain caps in place until installation.
  - 2. Store valves in shipping containers and maintain in place until installation.
    - a. Store valves indoors in dry environment.
    - b. Store valves off the ground in watertight enclosures when indoor storage is not an option.

## PART 2 PRODUCTS

### 2.01 APPLICATIONS

- A. See drawings for specific valve locations.
- B. Listed pipe sizes shown using nominal pipe sizes (NPS) and nominal diameter (DN).
- C. Provide the following valves for the applications if not indicated on drawings:
  - 1. Shutoff: Ball, butterfly.
  - 2. Throttling: Provide ball or butterfly.
  - 3. Swing Check (Pump Outlet):
    - a. 2 inch (50 mm, DN) and Smaller: Bronze swing check valves with bronze or nonmetallic disc.
    - b. 2-1/2 inch (65 mm, DN) and Larger for Domestic Water: Iron swing check valves with closure control, metal or resilient seat check valves.
- D. Substitutions of valves with higher CWP classes or WSP ratings for same valve types are permitted when specified CWP ratings or WSP classes are not available.
- E. Domestic, Hot and Cold Water Valves:
  - 1. 2 inch (50 mm, DN) and Smaller:
    - a. Bronze and Brass: Provide with solder-joint ends.
    - b. Ball: One piece, full port, brass with brass trim.
    - c. Bronze Swing Check: Class 125, bronze disc.
  - 2. 2-1/2 inch (65 mm, DN) and Larger:

## 2.02 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. Hand Lever: Quarter-turn valves 6 inch (150 mm, DN) and smaller except plug valves.
- D. Insulated Piping Valves: With 2 inch (50 mm, 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. Solder Joint Connections: ASME B16.18.
- F. General ASME Compliance:
  - 1. Solder-joint Connections: ASME B16.18.
  - 2. Building Services Piping Valves: ASME B31.9.
- G. Potable Water Use:
  - 1. Certified: Approved for use in compliance with NSF 61 and NSF 372.
  - 2. Lead-Free Certified: Wetted surface material includes less than 0.25 percent lead content.

## 2.03 BRASS, BALL VALVES

- A. One Piece, Full Port with Brass Trim and Push-to-fit or Threaded Connections:
  - 1. Comply with MSS SP-110.
  - 2. CWP Rating: 200 psi (1379 kPa).
  - 3. Body: Forged brass.
  - 4. Seats: PTFE.
  - 5. Stem: Brass.
  - 6. Ball: Chrome-plated brass.
  - 7. Operator: Handle.

## 2.04 BRONZE, BALL VALVES

- A. General:
  - 1. Fabricate from dezincification resistant material.
  - 2. Copper alloys containing more than 15 percent zinc are not permitted.
- B. One Piece, Reduced Port with Bronze Trim:
  - 1. Comply with MSS SP-110.
  - 2. WSP Rating: 400 psi (2760 kPa).
  - 3. CWP Rating: 600 psi (4140 kPa).
  - 4. Body: Bronze.

5. End Connections: Pipe press.
6. Seats: PTFE.

## **2.05 BRASS, INLINE CHECK VALVES**

- A. Class 150:
1. Maximum Service Temperature: 250 degrees F (121.1 degrees C).
  2. Body: Forged brass.
  3. Disc: Forged brass.
  4. Seal: PTFE, bubble-tight.
  5. End Connections: Press.

## **2.06 BRONZE, SWING CHECK VALVES**

- A. General:
1. Fabricate from dezincification resistant material.
  2. Copper alloys containing more than 15 percent zinc are not permitted.
- B. Class 125:
1. Pressure and Temperature Rating: MSS SP-80, Type 3.
  2. Design: Y-pattern, horizontal or vertical flow.
  3. WOG Rating: 200 psi (1380 kPa).
  4. Body: Bronze, ASTM B62.
  5. End Connections: Threaded.
  6. Disc: Bronze.

## **2.07 IRON, SWING CHECK VALVES WITH CLOSURE CONTROL**

- A. Class 125 with Lever and Spring-Closure Control.
1. Comply with MSS SP-71, Type I.
  2. Description:
    - a. CWP Rating: 200 psi (1380 kPa).
    - b. Design: Clear or full waterway.
    - c. Body: ASTM A126, gray iron with bolted bonnet.
    - d. Ends: Flanged as indicated.
    - e. Trim: Bronze.
    - f. Gasket: Asbestos free.
    - g. Closer Control: Factory installed, exterior lever, and weight.

## **2.08 THERMOSTATIC BALANCE VALVES**

- A. Thermostatic Balance Valve
1. The valve body shall be certified lead free according to NSF/ANSI 61 standards.
  2. The valve body shall be constructed out of stainless steel.
  3. The valve shall be rated for 20 PSIG working pressure and 250°F max. temperature.

4. The valve shall have a fixed, non-adjustable (tamper proof) temperature setpoint; temperature setpoints range from 80°F (27°C) to 170°F (77°C) in 5°F (2.8°C) increments.
  5. The valve shall have a temperature accuracy of  $\pm 3.0^\circ\text{F}$  ( $\pm 1.7^\circ\text{C}$ ).
  6. The valve shall have a wax thermostatic element.
  7. The valve shall come in 6 sizes: 1/2"; 3/4"; 1"; 1 1/4"; 1 1/2"; 2".
- B. Accessories
1. Union body with shutoff valves.
- C. Manufacturers:
1. ThermOmega Tech Inc.; circuitsolver.com
    - a. Model: CSUA

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Discard all packing materials and verify that valve interior, including threads and flanges are completely clean without signs of damage or degradation that could result in leakage.
- B. Verify valve parts to be fully operational in all positions from closed to fully open.
- C. Confirm gasket material to be suitable for the service, to be of correct size, and without defects that could compromise effectiveness.
- D. Should valve is determined to be defective, replace with new valve.

#### **3.02 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.

**END OF SECTION 220523**

**SECTION 220529****HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Prefabricated trapeze-framed systems.
- B. Strut systems for pipe or equipment support.
- C. Beam clamps.
- D. Pipe hangers.
- E. Pipe supports, guides, shields, and saddles.

**1.02 RELATED REQUIREMENTS**

- A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.
- B. Section 055000 - Metal Fabrications.

**1.03 REFERENCE STANDARDS**

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- C. ASTM A181/A181M - Standard Specification for Carbon Steel Forgings, for General-Purpose Piping; 2023.
- D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- E. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2022).
- F. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2018.
- G. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures; 1999 (Reapproved 2022).
- H. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.
- I. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2023.
- J. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.
- K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

- L. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.
- M. FM (AG) - FM Approval Guide; Current Edition.
- N. MFMA-4 - Metal Framing Standards Publication; 2004.
- O. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).
- P. UL (DIR) - Online Certifications Directory; Current Edition.
- Q. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

#### **1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
  - 2. Coordinate the work with other trades to provide additional framing and materials required for installation.
  - 3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
  - 4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
  - 5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
  - 1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 033000.

#### **1.05 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for metal channel (strut) framing systems, post-installed concrete and masonry anchors, and thermal insulated pipe supports.
- C. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.
- D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

#### **1.06 QUALITY ASSURANCE**

- A. Comply with applicable building code.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

## 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

## PART 2 PRODUCTS

### 2.01 GENERAL REQUIREMENTS

- A. Provide required hardware to hang or support piping, equipment, or fixtures with related accessories as necessary to complete installation of plumbing work.
- B. Provide hardware products listed, classified, and labeled as suitable for intended purpose.
- C. Materials for Metal Fabricated Supports: Comply with Section 055000.
  1. Zinc-Plated Steel: Electroplated in accordance with ASTM B633 unless stated otherwise.
  2. Galvanized Steel: Hot-dip galvanized in accordance with ASTM A123/A123M or ASTM A153/A153M unless stated otherwise.
- D. Corrosion Resistance: Use corrosion-resistant metal-based materials fully compatible with exposed piping materials and suitable for the environment where installed.

### 2.02 PREFABRICATED TRAPEZE-FRAMED SYSTEMS

- A. Prefabricated Trapeze-Framed Metal Strut Systems:
  1. MFMA-4 compliant, pre-fabricated, MSS SP-58 Type 59 continuous-slot metal strut channel with associated tracks, fittings, and related accessories.
  2. MFMA-4 compliant, prefabricated, side-loading continuous-slot metal strut channel bracket with associated tracks, fittings, and related accessories.
  3. Strut Channel or Bracket Material:
    - a. Indoor Dry Locations: Use zinc-plated steel or galvanized steel.
  4. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch (2.66 mm).
  5. Minimum Channel Dimensions: 1-5/8 inch (41 mm) width by 13/16 inch (21 mm) height.
  6. Accessories: Provide bracket covers, cable basket clips, cable tray clips, clamps, conduit clamps, fire-retarding brackets, j-hooks, protectors, and vibration dampeners.

### 2.03 STRUT SYSTEMS FOR PIPE OR EQUIPMENT SUPPORT

- A. Strut Channels:
  1. ASTM A653/A653M galvanized steel bracket with clamps for surface mounting of piping or plumbing equipment support.
  2. Channel or Bracket Kits: Include rods, brackets, end-fixed fittings, covers, clips, and other related hardware required to complete sectional trapeze section for piping or other support.
- B. Hanger Rods:
  1. Threaded zinc-plated steel unless otherwise indicated.

2. Minimum Size, Unless Otherwise Indicated or Required:
  - a. Equipment Supports: 1/2 inch (13 mm, DN) diameter.
  - b. Piping up to 1 inch (25 mm, DN): 1/4 inch (6 mm, DN) diameter.
  - c. Piping larger than 1 inch (25 mm, DN): 3/8 inch (10 mm, DN) diameter.
  - d. Trapeze Support for Multiple Pipes: 3/8 inch (10 mm) in length.
- C. Channel Nuts:
  1. Provide carbon steel channel nut with epoxy copper or zinc finish and long, regular, or short spring as indicated on drawings.

## 2.04 PIPE HANGERS

- A. Band Hangers, Adjustable:
  1. MSS SP-58 type 7 or 9, zinc-plated ASTM A1011/A1011M steel or ASTM A653/A653M carbon steel.
- B. J-Hangers, Adjustable:
  1. MSS SP-58 type 5, zinc-plated ASTM A1011/A1011M steel or ASTM A653/A653M carbon steel.
  2. Felt-Lined: Provide for uninsulated pipe to reduce noise and prevent static issues.
- C. Swivel Ring Hangers, Adjustable:
  1. MSS SP-58 type 10, epoxy-painted, zinc-colored.
  2. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.
  3. FM (AG) and UL (DIR) listed for specific pipe size runs and loads.
  4. Felt-Lined: Provide for uninsulated pipe to reduce noise and prevent static issues.
- D. Clevis Hangers, Adjustable:
  1. Copper Tube: MSS SP-58 type 1, epoxy-plated copper.
  2. Felt-Lined: MSS SP-58 type 1, zinc-plated, silicone-free carbon steel.
  3. Light-Duty: MSS SP-58 type 1, zinc-colored, epoxy plated.
  4. Standard-Duty: MSS SP-58 type 1, zinc-colored, epoxy plated.
  5. UL (DIR) listed: Pipe sizes 2-1/2 to 8 inch (65 to 200 mm, DN).

## 2.05 PIPE CLAMPS

- A. Riser Clamps:
  1. For insulated pipe runs, provide two bolt-type clamps designed for installation under insulation.
  2. MSS SP-58 type 1 or 8, carbon steel or steel with epoxy plated, plain, stainless steel, or zinc plated finish.
  3. UL (DIR) listed: Pipe sizes 1/2 to 8 inch (15 to 200 mm, DN).
- B. Strut Clamps:

1. Pipe Clamp: Two-piece rigid, universal, or outer diameter type, carbon steel with epoxy copper or zinc finish.
- C. Insulation Coupling:
1. Two bolt-type clamps designed for installation under insulation.
  2. Material: Carbon steel with epoxy copper or zinc finish.

## 2.06 PIPE SUPPORTS, GUIDES, SHIELDS, AND SADDLES

- A. Dielectric Barriers: Provide between metallic supports and metallic piping and associated items of dissimilar type; acceptable dielectric barriers include rubber or plastic sheets or coatings attached securely to pipe or item.
- B. Stanchions:
1. Material: Malleable iron, ASTM A47/A47M; or carbon steel, ASTM A36/A36M.
  2. Provide coated or plated saddles to isolate steel hangers from dissimilar metal tube or pipe.
- C. U-Bolts:
1. MSS SP-58 type 24, carbon steel u-bolt for pipe support or anchoring.
- D. Pipe Shields for Insulated Piping:
1. MSS SP-58 type 40, ASTM A1011/A1011M steel or ASTM A653/A653M carbon steel.
  2. General Construction and Requirements:
    - a. Surface Burning Characteristics: Comply with ASTM E84 or UL 723.
    - b. Shields Material: UV-resistant polypropylene with glass fill.
    - c. Maximum Insulated Pipe Outer Diameter: 12-5/8 inch (321 mm).
    - d. Service Temperature: Minus 40 to 178 degrees F (Minus 40 to 81 degrees C).
    - e. Pipe shields to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.
- E. Pipe Supports:
1. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.
  2. Liquid Temperatures Up to 122 degrees F (50 degrees C):
    - a. Overhead Support: MSS SP-58 types 1, 3 through 12 clamps.
    - b. Support From Below: MSS SP-58 types 35 through 38.
- F. Pipe Supports, Thermal Insulated:
1. General 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. Provide pipe supports for 1/2 to 30 inch (15 to 750 mm, DN) iron pipes.

- d. Insulation inserts to consist of rigid phenolic foam insulation surrounded by 360 degree, PVC jacketing.
2. PVC Jacket:
  - a. Pipe insulation protection shields to be provided with 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. Minimum Thickness: 60 mil, 0.06 inch (1.524 mm).

### **PART 3 EXECUTION**

#### **3.01 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.

#### **3.02 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.
- C. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
- D. Unless specifically indicated or approved by Architect, do not provide support from roof deck.
- E. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- F. Provide thermal insulated pipe supports complete with hangers and accessories. Install thermal insulated pipe supports during the installation of the piping system.
- G. Equipment Support and Attachment:
  1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
  2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
  3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
  4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- H. Secure fasteners according to manufacturer's recommended torque settings.
- I. Remove temporary supports.

**3.03 FIELD QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements for additional requirements.
- B. Inspect support and attachment components for damage and defects.
- C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- D. Correct deficiencies and replace damaged or defective support and attachment components.

**END OF SECTION 220529**

**SECTION 220553**  
**IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Nameplates.
- B. Tags.
- C. Pipe markers.
- D. Underground warning tape.

**1.02 RELATED REQUIREMENTS**

- A. Section 099123 - Interior Painting: Identification painting.

**1.03 REFERENCE STANDARDS**

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2023.
- B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2017.

**1.04 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Schedules:
  - 1. Submit plumbing component identification schedule listing equipment, piping, and valves.
  - 2. Detail proposed component identification data in terms of of wording, symbols, letter size, and color coding to be applied to corresponding product.
  - 3. Valve Data Format: Include id-number, location, function, and model number.

**PART 2 PRODUCTS****2.01 PLUMBING COMPONENT IDENTIFICATION GUIDELINE**

- A. Nameplates:
  - 1. Heat exchangers, water heaters, and other heat transfer products.
  - 2. Control panels, transducers, and other related control equipment products.
  - 3. Pumps, tanks, filters, water treatment devices, and other plumbing equipment products.
- B. Tags:
  - 1. Piping: 3/4 inch (20 mm) diameter and smaller.
  - 2. Manual operated and automated control valves.
- C. Pipe Markers: 3/4 inch (20 mm) diameter and higher.

**2.02 NAMEPLATES**

- A. Manufacturers:
  - 1. Brimar Industries, Inc: [www.pipemarker.com/#sle](http://www.pipemarker.com/#sle).
  - 2. Kolbi Pipe Marker Co: [www.kolbipipemarkers.com/#sle](http://www.kolbipipemarkers.com/#sle).

3. Seton Identification Products: [www.seton.com/#sle](http://www.seton.com/#sle).
  4. Substitutions: See Section 016000 - Product Requirements.
- B. Description: Laminated piece with up to three lines of text.
1. Letter Color: White.
  2. Letter Height: 1/4 inch (6 mm).
  3. Background Color: Black.
  4. Nameplate Height: 3/4 inch (19 mm).
  5. Nameplate Material:
    - a. Flexible: Vinyl with adhesive backing per ASTM D709.
    - b. Metal: Brass with center-side holes for screw fastening.

### 2.03 TAGS

- A. Flexible: Vinyl with engraved black letters on light contrasting background color with up to three lines of text. Minimum tag size 1-1/2 inch (40 mm) in diameter.
- B. Metal: Brass, 19 gauge 1-1/2 inch (40 mm) in diameter with smooth edges, blank, smooth edges, and corrosion-resistant ball chain. Up to three lines of text.
- C. Valve Tag Chart: Typewritten 12-point letter size list in anodized aluminum frame.
- D. Piping: 3/4 inch (20 mm) diameter and smaller. Include corrosion resistant chain. Identify service, flow direction, and pressure.

### 2.04 PIPE MARKERS

- A. Manufacturers:
1. Brady Corporation: [www.bradycorp.com/#sle](http://www.bradycorp.com/#sle).
  2. Brimar Industries, Inc: [www.pipemarker.com/#sle](http://www.pipemarker.com/#sle).
  3. Craftmark Pipe Markers: [www.craftmarkid.com/#sle](http://www.craftmarkid.com/#sle).
  4. Kolbi Pipe Marker Co: [www.kolbipipemarkers.com/#sle](http://www.kolbipipemarkers.com/#sle).
  5. Seton Identification Products: [www.seton.com/#sle](http://www.seton.com/#sle).
  6. Substitutions: See Section 016000 - Product Requirements.
- B. Comply with ASME A13.1.
- C. Flexible Marker: Factory fabricated, semi-rigid, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid conveyed.
- D. Flexible Tape Marker: Flexible, vinyl film tape with pressure-sensitive adhesive backing and printed markings.
- E. Underground Flexible Marker: Bright-colored continuously printed ribbon tape, minimum 6 inches (150 mm) wide by 4 mil, 0.004 inch (0.10 mm) thick, manufactured for direct burial service.
- F. Identification Scheme, ASME A13.1:
1. Primary: External Pipe Diameter, Uninsulated or Insulated.
    - a. 3/4 to 1-1/4 inches (19 to 32 mm): Use 8 inch (203 mm) field-length with 1/2 inch (13 mm) text height.

- b. 1-1/2 to 2 inches (38 to 51 mm): Use 8 inch (203 mm) field-length with 3/4 inch (19 mm) text height.
  - c. 2-1/2 to 6 inches (64 to 152 mm): Use 12 inch (305 mm) field-length with 1-1/4 inch (32 mm) text height.
2. Secondary: Color scheme per fluid service.
    - a. Fire Quenching Fluids: White text on red background.
    - b. Flammable and Oxidizing Fluids: Black text on yellow background.
    - c. Water; Potable, Cooling, Boiler Feed, and Other: White text on green background.

## 2.05 UNDERGROUND WARNING TAPE

- A. Manufacturers:
  1. Brady Corporation: [www.bradyid.com/#sle](http://www.bradyid.com/#sle).
  2. Brimar Industries, Inc: [www.brimar.com/#sle](http://www.brimar.com/#sle).
  3. Kolbi Pipe Marker Co: [www.kolbipipemarkers.com/#sle](http://www.kolbipipemarkers.com/#sle).
  4. Seton Identification Products: [www.seton.com/#sle](http://www.seton.com/#sle).
  5. Substitutions: See Section 016000 - Product Requirements.
- B. Materials: Use non-detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.
  1. Exception: Use foil-backed detectable type tape where required by serving utility or where directed by Owner.
- C. Non-detectable Type Tape: 6 inches (152 mm) wide, with minimum thickness of 4 mil, 0.004 inch (0.10 mm).
- D. Foil-backed Detectable Type Tape: 3 inches (76 mm) wide, with minimum thickness of 5 mil, 0.005 inch (0.12 mm), unless otherwise required for proper detection.
- E. Legend: Type of service, continuously repeated over full length of tape.
- F. Color: per OSHA stan

## PART 3 EXECUTION

### 3.01 PREPARATION

- A. Degrease and clean surfaces to receive identification products.

### 3.02 INSTALLATION

- A. Install flexible nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install tags in clear view and align with axis of piping
- C. Install plastic pipe markers in accordance with manufacturer's instructions.
- D. Install plastic tape pipe marker around pipe in accordance with manufacturer's instructions.

- E. Install underground plastic pipe markers 6 to 8 inches (150 to 200 mm) below finished grade, directly above buried pipe.
- F. Apply ASME A13.1 Pipe Marking Rules:
  - 1. Place pipe marker adjacent to changes in direction.
  - 2. Place pipe marker adjacent each valve port and flange end.
  - 3. Place pipe marker at both sides of floor and wall penetrations.
  - 4. Place pipe marker every 25 to 50 feet (7.6 to 15.2 m) interval of straight run.

**END OF SECTION 220553**

**SECTION 220719  
PLUMBING PIPING INSULATION**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Flexible elastomeric cellular insulation.
- B. Glass fiber insulation.
- C. Jacketing and accessories.

**1.02 RELATED REQUIREMENTS**

- A. Section 078400 - Firestopping.

**1.03 REFERENCE STANDARDS**

- A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019, with Editorial Revision (2023).
- B. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement; 2007 (Reapproved 2019).
- C. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2023.
- D. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2022a.
- E. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2023).
- F. ASTM C1423 - Standard Guide for Selecting Jacketing Materials for Thermal Insulation; 2021.
- G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- H. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.
- I. SAE AMS3779 - Tape, Adhesive, Pressure-Sensitive Thermal Radiation Resistant, Aluminum Coated Glass Cloth; 2016b.
- J. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

**1.04 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.
- C. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

**1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

**1.07 FIELD CONDITIONS**

- A. Maintain ambient conditions required by manufacturers of each product.
- B. Maintain temperature before, during, and after installation for minimum of 24 hours.

**PART 2 PRODUCTS****2.01 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.

**2.02 GLASS FIBER INSULATION**

- A. Manufacturers:
  - 1. CertainTeed Corporation: [www.certainteed.com/#sle](http://www.certainteed.com/#sle).
  - 2. Johns Manville Corporation: [www.jm.com/#sle](http://www.jm.com/#sle).
  - 3. Knauf Insulation: [www.knaufinsulation.com/#sle](http://www.knaufinsulation.com/#sle).
  - 4. Owens Corning Corporation; Fiberglas Pipe Insulation ASJ: [www.owenscorning.com/en-us/#sle](http://www.owenscorning.com/en-us/#sle).
  - 5. Substitutions: See Section 016000 - Product Requirements.
- B. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
  - 1. K (Ksi) Value: ASTM C177, 0.24 at 75 degrees F (0.035 at 24 degrees C).
  - 2. Maximum Service Temperature: 850 degrees F (454 degrees C).
  - 3. Maximum Moisture Absorption: 0.2 percent by volume.
- C. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm (0.029 ng/(Pa s m)).
- D. Tie Wire: 0.048 inch (1.22 mm) stainless steel with twisted ends on maximum 12 inch (300 mm) centers.
- E. Vapor Barrier Lap Adhesive: Compatible with insulation.
- F. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.

**2.03 FLEXIBLE ELASTOMERIC CELLULAR INSULATION**

- A. Manufacturers:
  - 1. Aeroflex USA; AEROFLEX Self-Seal: [www.aeroflexusa.com/#sle](http://www.aeroflexusa.com/#sle).
  - 2. Armacell LLC; AP Armaflex: [www.armacell.us/#sle](http://www.armacell.us/#sle).
  - 3. K-Flex USA LLC; Insul-Tube: [www.kflexusa.com/#sle](http://www.kflexusa.com/#sle).

- B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.
  - 1. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
  - 2. Maximum Service Temperature: 220 degrees F (104 degrees C).
  - 3. Connection: Waterproof vapor barrier adhesive.
- C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.
- D. Weather Barrier: Air dried, contact adhesive, compatible with insulation and ASTM E84 compliant.

#### **2.04 JACKETING AND ACCESSORIES**

- A. PVC Plastic Jacket:
  - 1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
    - a. Minimum Service Temperature: 0 degrees F (Minus 18 degrees C).
    - b. Maximum Service Temperature: 150 degrees F (66 degrees C).
    - c. Moisture Vapor Permeability: 0.002 perm inch (0.0029 ng/(Pa s m)), maximum, when tested in accordance with ASTM E96/E96M.
    - d. Thickness: 10 mil, 0.010 inch (0.25 mm).
    - e. Connections: Brush on welding adhesive.
- B. Reinforced Tape:
  - 1. FSK tape suitable for sealing seams between insulation, insulated pipe bends, and fittings resulting in a tight, smooth surface without wrinkles.
  - 2. Comply with UL 723 or ASTM E84.
  - 3. Moisture Vapor Permeability: 0.00 perm inch (0.00 ng/(Pa s m)), when tested in accordance with ASTM E96/E96M.
  - 4. Finish: Match insulation.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that piping has been tested before applying insulation materials.
- B. Verify that surfaces are clean and dry, with foreign material removed.

#### **3.02 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with North American Insulation Manufacturers Association (NAIMA) National Insulation Standards.
- C. Exposed Piping: Locate insulation and cover seams in least visible locations.
- D. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
- E. Glass fiber insulated pipes conveying fluids below ambient temperature:

1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
  2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.
- F. For hot piping conveying fluids 140 degrees F (60 degrees C) or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.
- G. Glass fiber insulated pipes conveying fluids above ambient temperature:
1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples.
  2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
- H. Inserts and Shields:
1. Application: Piping 1-1/2 inches (40 mm) diameter or larger.
  2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
  3. Insert Location: Between support shield and piping and under the finish jacket.
  4. Insert Configuration: Minimum 6 inches (150 mm) long, of same thickness and contour as adjoining insulation; may be factory fabricated.
  5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.
- I. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, see Section 078400.
- J. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet (3 meters) above finished floor): Finish with canvas jacket sized for finish painting.

**END OF SECTION 220719**

**SECTION 221005  
PLUMBING PIPING**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Sanitary waste piping, buried within 5 feet (1500 mm) of building.
- B. Sanitary waste piping, above grade.
- C. Domestic water piping, buried within 5 feet (1500 mm) of building.
- D. Domestic water piping, above grade.
- E. Storm drainage piping, buried within 5 feet (1500 mm) of building.
- F. Storm drainage piping, above grade.
- G. Natural gas piping, buried within 5 feet (1500 mm) of building.
- H. Natural gas piping, above grade.
- I. Pipe flanges, unions, and couplings.
- J. Pipe hangers and supports.
- K. Pipe sleeve-seal systems.
- L. Ball valves.
- M. Butterfly valves.
- N. Pressure reducing valves.
- O. Pressure relief valves.
- P. Pressure-temperature valves.
- Q. Strainers.

**1.02 RELATED REQUIREMENTS**

- A. Section 083100 - Access Doors and Panels.
- B. Section 220516 - Expansion Fittings and Loops for Plumbing Piping.
- C. Section 220529 - Hangers and Supports for Plumbing Piping and Equipment.
- D. Section 220553 - Identification for Plumbing Piping and Equipment.
- E. Section 330110.58 - Disinfection of Water Utility Piping Systems.

**1.03 REFERENCE STANDARDS**

- A. ANSI Z21.22 - American National Standard for Relief Valves for Hot Water Supply Systems; 2015 (Reaffirmed 2020).
- B. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2021.
- C. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.
- D. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2021.

- E. ASME B16.51 - Copper and Copper Alloy Press-Connect Pressure Fittings; 2021.
- F. ASME B31.1 - Power Piping; 2024.
- G. ASME B31.9 - Building Services Piping; 2020.
- H. ASSE 1003 - Water Pressure Reducing Valves for Potable Water Distribution Systems; 2023.
- I. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2022).
- J. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.
- K. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2023a.
- L. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2022.
- M. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2020.
- N. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube; 2016.
- O. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings; 2023.
- P. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2020a.
- Q. ASTM C1277 - Standard Specification for Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings; 2020.
- R. ASTM C1540 - Standard Specification for Heavy-Duty Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings; 2020.
- S. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2020.
- T. ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings; 2020.
- U. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2021.
- V. ASTM D2855 - Standard Practice for the Two-Step (Primer and Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets; 2020.
- W. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2023.
- X. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

- Y. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe; 2014 (Reapproved 2021).
- Z. ASTM F679 - Standard Specification for Poly(Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings; 2021.
- AA. ASTM F876 - Standard Specification for Crosslinked Polyethylene (PEX) Tubing; 2024.
- BB. ASTM F877 - Standard Specification for Crosslinked Polyethylene (PEX) Hot- and Cold-Water Distribution Systems; 2024.
- CC. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; 2018.
- DD. AWWA C550 - Protective Interior Coatings for Valves and Hydrants; 2024.
- EE. AWWA C606 - Grooved and Shouldered Joints; 2022.
- FF. AWWA C651 - Disinfecting Water Mains; 2023.
- GG. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2020.
- HH. FM 1680 - Approval Standard for Couplings Used in Hubless Cast Iron Systems for Drain, Waste or Vent, Sewer, Rainwater or Storm Drain Systems Above and Below Ground, Industrial/ Commercial and Residential; 1989.
- II. IAPMO (UPC) - Uniform Plumbing Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- JJ. IAPMO/ANSI/CAN Z1117 - Standard for Press Connections; 2022.
- KK. ICC (IPC) - International Plumbing Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- LL. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2018, with Editorial Revision (2020).
- MM. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry; 2018, with Editorial Revision (2020).
- NN. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2017, with Editorial Revision (2020).
- OO. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2023.
- PP. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).
- QQ. MSS SP-67 - Butterfly Valves; 2022.
- RR. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010, with Errata .
- SS. NSF 61 - Drinking Water System Components - Health Effects; 2024.
- TT. NSF 372 - Drinking Water System Components - Lead Content; 2024.

UU. PPI TR-4 - PPI HSB Listing of Hydrostatic Design Basis (HDB), Hydrostatic Design Stress (HDS), Strength Design Basis (SDB), Pressure Design Basis (PDB) and Minimum Required Strength (MRS) Ratings for Thermoplastic Piping Materials or Pipe; 2024.

VV. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

#### **1.04 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

#### **1.05 QUALITY ASSURANCE**

- A. Perform work in accordance with applicable codes.
- B. Valves: Manufacturer's name and pressure rating marked on valve body.
- C. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

#### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- B. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

#### **1.07 FIELD CONDITIONS**

- A. Do not install underground piping when bedding is wet or frozen.

### **PART 2 PRODUCTS**

#### **2.01 GENERAL REQUIREMENTS**

- A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.
- B. Plenum-Installed Acid Waste Piping: Flame-spread index equal or below 25 and smoke-spread index equal or below 50 according to ASTM E84 or UL 723 tests.

#### **2.02 SANITARY WASTE PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING**

- A. PVC Pipe: ASTM D2665 or ASTM D3034.
  - 1. Fittings: PVC.
  - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.
- B. PVC Pipe: ASTM D2665, ASTM D3034, or ASTM F679.
  - 1. Fittings: PVC.
  - 2. Joints: Push-on, using ASTM F477 elastomeric gaskets.

#### **2.03 SANITARY WASTE PIPING, ABOVE GRADE**

- A. PVC Pipe: ASTM D2729.

1. Fittings: PVC.
  2. Joints: Solvent welded, with ASTM D2564 solvent cement.
- B. PVC Pipe: ASTM D2665.
1. Fittings: PVC.
  2. Joints: Solvent welded, with ASTM D2564 solvent cement.

#### **2.04 DOMESTIC WATER PIPING, ABOVE GRADE**

- A. Copper Pipe: ASTM B88 (ASTM B88M), Type K (A), Drawn (H).
1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
  2. Joints: Grooved mechanical couplings.
  3. Mechanical Press Sealed Fittings: ASME B16.51 or IAPMO/ANSI/CAN Z1117, ICC (IPC), and IAPMO (UPC) approved, NSF 61 and NSF 372 certified, with EPDM seals.
- B. Cross-Linked Polyethylene (PEX) Pipe: ASTM F876 or ASTM F877.
1. PPI TR-4 Pressure Design Basis:
    - a. 160 psig (1102 kPa) at maximum 73 degrees F (23 degrees C).
    - b. 100 psig (689 kPa) at maximum 180 degrees F (82 degrees C).
  2. Fittings: Brass and copper.
  3. Joints: Mechanical compression fittings.

#### **2.05 STORM DRAINAGE PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING**

- A. PVC Pipe: ASTM D2665 or ASTM D3034.
1. Fittings: PVC.
  2. Joints: Solvent welded, with ASTM D2564 solvent cement.
- B. PVC Pipe: ASTM D2665, ASTM D3034, or ASTM F679.
1. Fittings: PVC.
  2. Joints: Push-on, using ASTM F477 elastomeric gaskets.

#### **2.06 STORM DRAINAGE PIPING, ABOVE GRADE**

- A. PVC Pipe: ASTM D2665.
1. Fittings: PVC.
  2. Joints: Solvent welded, with ASTM D2564 solvent cement.

#### **2.07 NATURAL GAS PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING**

- A. Steel Pipe: ASTM A53/A53M, Grade B, Type F, Schedule 40 black.
1. Fittings: ASTM A234/A234M, wrought steel welding type.
  2. Joints: ASME B31.1, welded.
  3. Jacket: AWWA C105/A21.5 polyethylene jacket or double layer, half-lapped 10 mil (0.25 mm) polyethylene tape.

#### **2.08 NATURAL GAS PIPING, ABOVE GRADE**

- A. Steel Pipe: ASTM A53/A53M Schedule 40 black.

1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M, wrought steel welding type.
2. Joints: Threaded or welded to ASME B31.1.

## 2.09 PIPE FLANGES, UNIONS, AND COUPLINGS

- A. Unions for Pipe Sizes 3 inch (80 mm, DN) and Under:
  1. Ferrous Pipe: Class 150 malleable iron threaded unions.
  2. Copper Tube and Pipe: Class 150 bronze unions with soldered joints.
- B. Flanges for Pipe Sizes Over 1 inch (25 mm, DN):
  1. Ferrous Pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
  2. Copper Tube and Pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.
- C. Mechanical Couplings for Grooved and Shouldered Joints: Two or more curved housing segments with continuous key to engage pipe groove, circular C-profile gasket, and bolts to secure and compress gasket.
  1. Dimensions and Testing: In accordance with AWWA C606.
  2. Housing Material: Provide ASTM A47/A47M malleable iron, ductile iron, or \_\_\_\_\_, galvanized.
  3. Gasket Material: EPDM suitable for operating temperature range from minus 30 degrees F (minus 34 degrees C) to 230 degrees F (110 degrees C).
  4. Bolts and Nuts: Hot dipped galvanized or zinc-electroplated steel.
  5. When pipe is field grooved, provide coupling manufacturer's grooving tools.
- D. No-Hub Couplings:
  1. Testing: In accordance with ASTM C1277 and CISPI 310.
  2. Gasket Material: Neoprene complying with ASTM C564.
  3. Band Material: Stainless steel.
  4. Eyelet Material: Stainless steel.
- E. Shielded, Heavy Duty No-Hub Couplings:
  1. Testing: In accordance with ASTM C1540 and FM 1680.
  2. Gasket Material: Neoprene complying with ASTM C564.
  3. Band Material: Stainless steel.
  4. Eyelet Material: Stainless steel.
- F. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

## 2.10 PIPE HANGERS AND SUPPORTS

- A. See Section 220529 for additional requirements.
- B. Provide hangers and supports that comply with MSS SP-58.
  1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.

2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
  3. Trapeze Hangers: Welded steel channel frames attached to structure.
  4. Vertical Pipe Support: Steel riser clamp.
- C. Plumbing Piping - Drain, Waste, and Vent:
1. Hangers for Pipe Sizes 1/2 to 1-1/2 inch (15 to 40 mm, DN): Malleable iron, adjustable swivel, split ring.
  2. Hangers for Pipe Sizes 2 inch (50 mm, DN) and Over: Carbon steel, adjustable, clevis.
  3. Wall Support for Pipe Sizes to 3 inch (80 mm, DN): Cast iron hook.
  4. Wall Support for Pipe Sizes 4 inch (100 mm, DN) and Over: Welded steel bracket and wrought steel clamp.
  5. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
- D. Plumbing Piping - Water:
1. Hangers for Pipe Sizes 1/2 to 1-1/2 inch (15 to 40 mm, DN): Malleable iron, adjustable swivel, split ring.
  2. Hangers for Cold Pipe Sizes 2 inch (50 mm, DN) and Over: Carbon steel, adjustable, clevis.
  3. Hangers for Hot Pipe Sizes 2 to 4 inch (50 to 100 mm, DN): Carbon steel, adjustable, clevis.
  4. Wall Support for Pipe Sizes Up to 3 inch (80 mm, DN): Cast iron hook.
  5. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- E. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
1. Concrete Wedge Expansion Anchors: Comply with ICC-ES AC193.
  2. Masonry Wedge Expansion Anchors: Comply with ICC-ES AC01.
  3. Concrete Screw Type Anchors: Comply with ICC-ES AC193.
  4. Masonry Screw Type Anchors: Comply with ICC-ES AC106.
  5. Concrete Adhesive Type Anchors: Comply with ICC-ES AC308.
  6. Other Types: As required.

## 2.11 PIPE SLEEVE-SEAL SYSTEMS

- A. Modular Mechanical Seals:
1. Elastomer-based interlocking links continuously fill annular space between pipe and wall-sleeve, wall or casing opening.
  2. Watertight seal between pipe and wall-sleeve, wall or casing opening.
  3. Size and select seal component materials in accordance to service requirements.
  4. Glass reinforced plastic pressure end plates.
- B. Wall Sleeve: PVC material with water-stop collar, and nailer end-caps.

## 2.12 BALL VALVES

- A. Construction, 4 inch (100 mm, DN) and Smaller: MSS SP-110, Class 150, 400 psi (2760 kPa) CWP, bronze or ductile iron body, 304 stainless steel or chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, threaded or grooved ends with union.

## 2.13 BUTTERFLY VALVES

- A. Construction 1-1/2 inch (40 mm, DN) and Larger: MSS SP-67, 200 psi (1380 kPa) CWP, cast or ductile iron body, nickel-plated ductile iron disc, resilient replaceable EPDM seat, wafer ends, extended neck, 10 position lever handle.
- B. Provide gear operators for valves 8 inches (150 mm, DN) and larger, and chain-wheel operators for valves mounted over 8 feet (2400 mm) above floor.

## 2.14 PRESSURE REDUCING VALVES

- A. 2 inch (50 mm, DN) and Smaller:
  - 1. ASSE 1003, bronze body, stainless steel, and thermoplastic internal parts, fabric reinforced diaphragm, strainer, threaded single union ends.
  - 2. Pressure Reducing Pilot-Operator:
    - a. Operating Range: 5 to 50 psi (0.35 to 35 Bar).
    - b. Connected into brass or bronze pilot piping and fittings.
    - c. Fixed flow restrictor, pressure gauges, and isolation valves.
- B. 2 inch (50 mm, DN) and Larger:
  - 1. ASSE 1003, cast iron body with interior lining complying with AWWA C550, bronze fitted, elastomeric diaphragm and seat disc, flanged.
  - 2. Pressure Reducing Pilot-Operator:
    - a. Operating Range: 5 to 50 psi (0.35 to 35 Bar).
    - b. Connected into brass or bronze pilot piping and fittings.
    - c. Fixed flow restrictor, strainer, pressure gauges, and isolation valves.

## 2.15 PRESSURE RELIEF VALVES

- A. ANSI Z21.22, AGA certified, bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated.

## 2.16 STRAINERS

- A. Size 1/2 inch (15 mm, DN) to 3 inch (80 mm, DN):
  - 1. Class 150, threaded forged bronze Y-pattern body, stainless steel perforated mesh screen with cap, and rated for 150 psi (1,034 kPa), 250 deg F (121.1 deg C) WOG service.
- B. Size 2 inch (50 mm, DN) and Smaller:
  - 1. Threaded brass body for 175 psi (1200 kPa) CWP, Y pattern with 1/32 inch (0.8 mm) stainless steel perforated screen.
  - 2. Class 150, threaded bronze body 300 psi (2070 kPa) CWP, Y pattern with 1/32 inch (0.8 mm) stainless steel perforated screen.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that excavations are to required grade, dry, and not over-excavated.

### **3.02 PREPARATION**

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

### **3.03 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- D. Install piping to maintain headroom, conserve space, and not interfere with use of space.
- E. Group piping whenever practical at common elevations.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. See Section 220516.
- G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- H. Provide access where valves and fittings are not exposed.
  - 1. Coordinate size and location of access doors with Section 083100.
- I. Provide support for utility meters in accordance with requirements of utility companies.
- J. Install bell and spigot pipe with bell end upstream.
- K. Install valves with stems upright or horizontal, not inverted. See Section 220523.
- L. Install water piping to ASME B31.9.
- M. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.
- N. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.
- O. Sleeve pipes passing through partitions, walls, and floors.
- P. Pipe Hangers and Supports:
  - 1. Install in accordance with ASME B31.9.
  - 2. Support horizontal piping as indicated.
  - 3. Install hangers to provide minimum 1/2 inch (15 mm) space between finished covering and adjacent work.

4. Place hangers within 12 inches (300 mm) of each horizontal elbow.
5. Use hangers with 1-1/2 inch (40 mm) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
6. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
8. Provide copper plated hangers and supports for copper piping.

Q. Pipe 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 watertight seal.
6. Install in accordance with manufacturer's recommendations.

### 3.04 APPLICATION

- A. Install unions downstream of valves and at equipment or apparatus connections.
- B. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.
- C. Provide spring-loaded check valves on discharge of water pumps.
- D. Provide flow controls in water recirculating systems where indicated.

### 3.05 TOLERANCES

- A. Drainage Piping: Establish invert elevations within 1/2 inch (10 mm) vertically of location indicated and slope to drain at minimum of 1/8 inch per foot (1:100) slope.
- B. Water Piping: Slope at minimum of 1/32 inch per foot (1:400) and arrange to drain at low points.

### 3.06 FIELD TESTS AND INSPECTIONS

- A. Verify and inspect systems according to requirements by the Authority Having Jurisdiction. In the absence of specific test and inspection procedures proceed as indicated below.
- B. Domestic Water Systems:
  1. Perform hydrostatic testing for leakage prior to system disinfection.
  2. Test Preparation: Close each fixture valve or disconnect and cap each connected fixture.
  3. General:

- a. Fill the system with water and raise static head to 10 psi (345 kPa) above service pressure. Minimum static head of 50 to 150 psi (345 to 1,034 kPa). As an exception, certain codes allow a maximum static pressure of 80 psi (551.6 kPa).
- C. Gas Distribution Systems:
  1. Test Preparation: Close each appliance valve or disconnect and cap each connected appliance.
  2. General Systems:
    - a. Inject a minimum of 10 psi (68.9 kPa) of compressed air into the piping system for a duration of 15 minutes and verify with a gauge that no perceptible pressure drop is measured.
    - b. Ensure test pressure gauge has a range of twice the specific pressure rate selected with an accuracy of 1/10 of 1 pound (0.45 kg).
- D. Test Results: Document and certify successful results, otherwise repair, document, and retest.

### **3.07 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM**

- A. Disinfect water distribution system in accordance with Section 330110.58.
- B. Prior to starting work, verify system is complete, flushed, and clean.
- C. Inject disinfectant, free chlorine in liquid, powder, tablet, or gas form throughout system to obtain 50 to 80 mg/L residual.
- D. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
- E. Maintain disinfectant in system for 24 hours.
- F. If final disinfectant residual tests less than 25 mg/L, repeat treatment.
- G. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.
- H. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

### **3.08 SERVICE CONNECTIONS**

- A. Provide new sanitary sewer services. Before commencing work, check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.
- B. Provide new water service complete with approved reduced pressure backflow preventer and water meter with by-pass valves, pressure reducing valve, and sand strainer.

### **3.09 SCHEDULES**

- A. Pipe Hanger Spacing:
  1. Metal Piping:

- a. Pipe Size: 1/2 inch (15 mm, DN) to 1-1/4 inch (32 mm, DN):
    - 1) Maximum Hanger Spacing: 6.5 ft (2 m).
    - 2) Hanger Rod Diameter: 3/8 inches (9 mm).
  - b. Pipe Size: 1-1/2 inch (40 mm, DN) to 2 inch (50 mm, DN):
    - 1) Maximum Hanger Spacing: 10 ft (3 m).
    - 2) Hanger Rod Diameter: 3/8 inch (9 mm).
  - c. Pipe Size: 2-1/2 inch (65 mm, DN) to 3 inch (80 mm, DN):
    - 1) Maximum Hanger Spacing: 10 ft (3 m).
    - 2) Hanger Rod Diameter: 1/2 inch (13 mm).
2. Plastic Piping:
    - a. All Sizes:
      - 1) Maximum Hanger Spacing: 6 ft (1.8 m).
      - 2) Hanger Rod Diameter: 3/8 inch (9 mm).

**END OF SECTION 221005**

**SECTION 221006  
PLUMBING PIPING SPECIALTIES**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Drains.
- B. Cleanouts.
- C. Hydrants.
- D. Washing machine outlet boxes.
- E. Water hammer arrestors.
- F. Mixing valves.
- G. Floor drain trap seals.

**1.02 REFERENCE STANDARDS**

- A. ASME A112.6.4 - Roof, Deck, and Balcony Drains; 2022.
- B. ASSE 1017 - Performance Requirements for Temperature Actuated Mixing Valves for Hot Water Distribution Systems; 2023.
- C. ASSE 1019 - Performance Requirements for Wall Hydrant with Backflow Protection and Freeze Resistance; 2023.
- D. NSF 61 - Drinking Water System Components - Health Effects; 2024.
- E. NSF 372 - Drinking Water System Components - Lead Content; 2024.
- F. PDI-WH 201 - Water Hammer Arresters; 2017.

**1.03 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Manufacturer's Instructions: Indicate Manufacturer's Installation Instructions: Indicate assembly and support requirements.
- C. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.
- D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 016000 - Product Requirements for additional provisions.
  - 2. Extra Loose Keys for Outside Hose Bibbs: One.

**1.04 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years documented experience.

## PART 2 PRODUCTS

### 2.01 GENERAL REQUIREMENTS

- A. Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and NSF 372 for maximum lead content.

### 2.02 DRAINS

- A. Roof Drains:
  - 1. Assembly: ASME A112.6.4.
  - 2. Body: Lacquered cast iron with sump.
  - 3. Strainer: Removable polyethylene dome with vandal proof screws.
  - 4. Manufacturers:
    - a. Jay R. Smith Manufacturing Company: [www.jrsmith.com/#sle](http://www.jrsmith.com/#sle).
    - b. MIFAB, Inc: [www.mifab.com/#sle](http://www.mifab.com/#sle).
    - c. Zurn Industries, LLC: [www.zurn.com/#sle](http://www.zurn.com/#sle).
    - d. Substitutions: See Section 016000 - Product Requirements.
- B. Floor Drains:
  - 1. Manufacturers:
    - a. Jay R. Smith Manufacturing Company: [www.jrsmith.com/#sle](http://www.jrsmith.com/#sle).
    - b. MIFAB, Inc: [www.mifab.com/#sle](http://www.mifab.com/#sle).
    - c. Zurn Industries, LLC: [www.zurn.com/#sle](http://www.zurn.com/#sle).
    - d. Substitutions: See Section 016000 - Product Requirements.

### 2.03 CLEANOUTS

- A. Manufacturers:
  - 1. Jay R. Smith Manufacturing Company: [www.jrsmith.com/#sle](http://www.jrsmith.com/#sle).
  - 2. Josam Company: [www.josam.com/#sle](http://www.josam.com/#sle).
  - 3. MIFAB, Inc: [www.mifab.com/#sle](http://www.mifab.com/#sle).
  - 4. Zurn Industries, LLC: [www.zurn.com/#sle](http://www.zurn.com/#sle).
  - 5. Substitutions: See Section 016000 - Product Requirements.
- B. Cleanouts at Exterior Surfaced Areas:
  - 1. Round cast nickel bronze access frame and non-skid cover.
- C. Cleanouts at Exterior Unsurfaced Areas:
  - 1. Line type with lacquered cast iron body and round epoxy coated gasketed cover.
- D. Cleanouts at Interior Finished Floor Areas:
  - 1. Lacquered cast iron body with anchor flange, reversible clamping collar, threaded top assembly, and round gasketed scored cover in service areas and round gasketed depressed cover to accept floor finish in finished floor areas.
- E. Cleanouts at Interior Finished Wall Areas:
  - 1. Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.

## 2.04 HYDRANTS

### A. Manufacturers:

1. Jay R. Smith Manufacturing Company: [www.jrsmith.com/#sle](http://www.jrsmith.com/#sle).
2. Zurn Industries, LLC: [www.zurn.com/#sle](http://www.zurn.com/#sle).
3. Woodford or Wade.
4. Substitutions: See Section 016000 - Product Requirements.

### B. Wall Hydrants:

1. ASSE 1019, freeze resistant, self-draining, hose thread spout, and integral vacuum breaker.

## 2.05 WASHING MACHINE OUTLET BOXES

### A. Manufacturers:

1. HoldRite, a brand of Reliance Worldwide Corporation: [www.holdrite.com/#sle](http://www.holdrite.com/#sle).
2. IPS Corporation/Water-Tite: [www.ipscorp.com/#sle](http://www.ipscorp.com/#sle).
3. Oatey Supply Chain Services, Inc: [www.oatey.com/#sle](http://www.oatey.com/#sle).
4. Zurn Industries, LLC: [www.zurn.com/#sle](http://www.zurn.com/#sle).
5. Substitutions: See Section 016000 - Product Requirements.

### B. Description: Plastic preformed rough-in box with brass quarter-turn ball valves or single lever-handle valves, socket for 2 inch (50 mm) waste, and slip-in finishing cover.

### C. Provide fire-rated outlet-box assembly for installation in 1- and 2-hour rated walls.

### D. Accessories:

1. Water-hammer arrestors.
2. Support brackets for installation between framing studs.

## 2.06 WATER HAMMER ARRESTORS

### A. Manufacturers:

1. Cash Acme, a brand of Reliance Worldwide Corporation: [www.cashacme.com/#sle](http://www.cashacme.com/#sle).
2. Jay R. Smith Manufacturing Company: [www.jrsmith.com/#sle](http://www.jrsmith.com/#sle).
3. Watts Regulator Company, a part of Watts Water Technologies: [www.wattsregulator.com/#sle](http://www.wattsregulator.com/#sle).
4. Zurn Industries, LLC: [www.zurn.com/#sle](http://www.zurn.com/#sle).
5. Substitutions: See Section 016000 - Product Requirements.

### B. Water Hammer Arrestors:

1. Copper or Stainless steel construction, bellows type sized in accordance with PDI-WH 201, precharged suitable for operation in temperature range minus 100 to 300 degrees F (minus 73 to 149 degrees C) and maximum 250 psi (1700 kPa) working pressure.

## 2.07 MIXING VALVES

### A. Digitally Controlled Thermostatic Master Mixing Valves:

1. Manufacturers:

- a. Leonard Valve Company: [www.leonardvalve.com/#sle](http://www.leonardvalve.com/#sle).
  - b. Substitutions: See Section 016000 - Product Requirements.
2. Valve: ASSE 1017, bronze or brass body; corrosion- and lime-resistant internal components; microprocessor-control unit for temperature control and monitoring.

## 2.08 FLOOR DRAIN TRAP SEALS

- A. Manufacturers:
  1. SureSeal
  2. Zurn
  3. Substitutions: See Section 016000 - Product Requirements.
- B. Description: Push-fit EPDM or silicone fitting with a one-way membrane.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.
- C. Encase exterior cleanouts in concrete flush with grade.
- D. Install floor cleanouts at elevation to accommodate finished floor.
- E. Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibbs.
- F. Pipe relief from backflow preventer to nearest drain.
- G. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to lavatory sinks, washing machine outlets, or \_\_\_\_.
- H. Install air chambers on hot and cold water supply piping to each fixture or group of fixtures (each washroom). Fabricate same size as supply pipe or 3/4 inch (20 mm) minimum, and minimum 18 inches (450 mm) long.

**END OF SECTION 221006**

**SECTION 221123  
DOMESTIC WATER PUMPS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Circulators.
- B. Pressure booster systems.

**1.02 RELATED REQUIREMENTS**

- A. Section 220548 - Vibration and Seismic Controls for Plumbing Piping and Equipment.

**1.03 REFERENCE STANDARDS**

- A. ICC (IPC) - International Plumbing Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- B. NSF 61 - Drinking Water System Components - Health Effects; 2024.

**1.04 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data:
  - 1. Provide certified pump curve with duty point marked over pump and system operating conditions and NPSH curve and power requirement by pump tag.
  - 2. Manufacturer's catalog sheets for fixtures, fittings, accessories, and supplies.
- C. Shop Drawings: Include dimensions and performance data.
- D. Test Reports: Plumbing fixture operational tests.
- E. Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.

**1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing type of products specified in this section, with minimum three years of documented experience.
- B. Identification: Provide pumps with manufacturer's name, model number, and rated capacity identified by permanently attached label.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

**PART 2 PRODUCTS****2.01 PRESSURE BOOSTER SYSTEMS**

- A. Manufacturers:
  - 1. Armstrong Fluid Technology; \_\_\_\_\_: [www.armstrongfluidtechnology.com/#sle](http://www.armstrongfluidtechnology.com/#sle).
  - 2. Bell & Gossett, a Brand of Xylem, Inc; \_\_\_\_\_: [www.xylem.com/#sle](http://www.xylem.com/#sle).

3. QuantumFlo; [www.quantumflo.com](http://www.quantumflo.com)\_\_\_\_\_.
- B. Description: Self-contained factory assembled pump skid with isolation valves, strainers, gauges, pipe and Class 300 fittings, system drain valve(s), component identification, signage, electrical raceway, equipment tags, instruments, and controls fitted on fabricated structural steel frame skid base; tested, adjusted, and shipped as integral unit.
- C. Packaged Performance:
  1. Flow: 144 gpm, at 120 feet of head.
  2. Electrical: 208, three phase, 60 Hz.
- D. Skid Vibration Isolation: See Section 220548.
- E. Pump Motor: Inverter duty, VFD-controlled 3,450 rpm, open drip-proof (ODP) type.
- F. Pipe-End Connections: Class 300 flange for sizes 4 inches (100 mm, DN) and larger otherwise threaded.
- G. Pipe and Fittings Material: Galvanized steel, Schedule 40.
- H. Low-Pressure Control: Stop pump operation if incoming water pressure drops to atmospheric.
- I. Isolation and Control Valves:
  1. Pump outlet combined pressure-reducing check valve assembly for near-uniform pressure.
  2. Butterfly valves at pump suction and discharge sides for pipe sizes above 4 inches (100 mm, DN), ball valves are acceptable for smaller pipe sizes.
  3. Actuators: If required, provide electronic type for modulation control, line voltage type for pipe or equipment isolation, or pneumatic type for high torque or nonwater applications.
  4. Manual Operators: Lock-out tag-out (LOTO) type for manual and actuator operated.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install products with related fittings, and accessories according to manufacturer instructions.
- B. Potable and Drinking Water Service: Provide NSF 61 certified; comply with ICC (IPC).
- C. Ensure that small pressure gauges are installed on both upstream and downstream ends.
- D. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are nonoverloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

### **3.02 FIELD QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements for additional requirements.

- B. Operational Tests: Upon completion and sterilization of plumbing systems, conduct operating tests to demonstrate satisfactory, functional, and operating efficiency.

### **3.03 CLEANING**

- A. Thoroughly clean plumbing fixtures and equipment.

### **3.04 PROTECTION**

- A. Protect installed products from damage due from subsequent construction operations.
- B. Repair or replace products damaged before Date of Substantial Completion.

**END OF SECTION 221123**

**SECTION 223000  
PLUMBING EQUIPMENT**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Commercial gas-fired water heaters.
- B. Domestic hot water storage tanks.
- C. In-line circulator pumps.

**1.02 REFERENCE STANDARDS**

- A. ANSI Z21.10.1 - Gas Water Heaters, Volume I, Storage Water Heaters with Input Ratings of 75,000 Btu per Hour or Less; 2019 (Reaffirmed 2024).
- B. ANSI Z21.10.3 - Gas-Fired Water Heaters, Volume III, Storage Water Heaters with Input Ratings Above 75,000 Btu per Hour, Circulating and Instantaneous; 2019 (Reaffirmed 2024).
- C. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

**1.03 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittals procedures.
- B. Product Data:
  - 1. Provide dimension drawings of water heaters indicating components and connections to other equipment and piping.
  - 2. Provide electrical characteristics and connection requirements.
- C. Project Record Documents: Record actual locations of components.
- D. Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.
- E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- F. Project Record Documents: Record actual locations of components.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 016000 - Product Requirements for additional provisions.

**1.04 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.
- B. Certifications:

1. Water Heaters: NSF approved.
2. Gas Water Heaters: ANSI Z21.10.1 and ANSI Z21.10.3.
3. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

#### **1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

#### **1.06 WARRANTY**

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide 5-year manufacturer warranty for \_\_\_\_\_. Complete forms in Owner's name and register with manufacturer.

### **PART 2 PRODUCTS**

#### **2.01 WATER HEATERS**

- A. Manufacturers:
  1. A.O. Smith Water Products Co: [www.hotwater.com/#sle](http://www.hotwater.com/#sle).
  2. Lochinvar: [www.lochinvar.com/#sle](http://www.lochinvar.com/#sle).
  3. Substitutions: See Section 016000 - Product Requirements.
- B. Commercial Gas-Fired Water Heaters:
  1. Type: Automatic, natural gas-fired, vertical storage.
  2. Minimum Efficiency Required: ASHRAE Std 90.1 I-P.
  3. Tank: Antimicrobial-infused, enamel-lined, welded steel, ASME labeled; multiple flue passages, 4-inch (100 mm) diameter inspection port, thermally insulated with minimum 2 inches (50 mm) glass fiber, encased in corrosion-resistant steel jacket; baked-on enamel finish; floor shield and legs.
  4. Accessories:
    - a. Water Connections: Brass.
    - b. Dip Tube: Brass.
    - c. Drain valve.
    - d. Anode: Magnesium.
    - e. Temperature and Pressure Relief Valve: ASME labeled.
  5. Controls: Automatic water thermostat with temperature range adjustable from 120 to 145 degrees F (49 to 82 degrees C), automatic reset high temperature limiting thermostat factory set at temperature as recommended by mfr., multi-ribbon or tubular burner, 100 percent safety shut-off pilot and thermocouple.

#### **2.02 IN-LINE CIRCULATOR PUMPS**

- A. Manufacturers:
  1. Armstrong Fluid Technology: [www.armstrongfluidtechnology.com/#sle](http://www.armstrongfluidtechnology.com/#sle).
  2. Bell & Gossett, a brand of Xylem, Inc: [www.bellgossett.com/#sle](http://www.bellgossett.com/#sle).
  3. Sterling SIHI GmbH: [www.sterlingsihi.com/#sle](http://www.sterlingsihi.com/#sle).
  4. Substitutions: See Section 016000 - Product Requirements.

- B. Casing: Bronze, rated for 125 psig (860 kPa) working pressure, with stainless steel rotor assembly.
- C. Impeller: Bronze.
- D. Shaft: Alloy steel with integral thrust collar and two oil lubricated bronze sleeve bearings.
- E. Seal: Carbon rotating against a stationary ceramic seat.
- F. Drive: Flexible coupling.

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION**

- A. Install plumbing equipment in accordance with manufacturer's instructions, as required by code, and complying with conditions required for applicable certifications.
- B. Coordinate system, equipment, and piping work with applicable electrical, fuel, gas, vent, drain, and waste support interconnections as included or provided by other trades.
- C. Domestic Water Storage Tanks:
  - 1. Provide support, independent of building structural framing members.
  - 2. Clean and flush prior to delivery to site. Seal until pipe connections are made.
- D. Pumps:
  - 1. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

#### **3.02 FIELD QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements for additional requirements.

**END OF SECTION 223000**

**SECTION 224000  
PLUMBING FIXTURES**

**PART 1 GENERAL****1.01 REFERENCE STANDARDS**

- A. NSF 61 - Drinking Water System Components - Health Effects; 2024.
- B. NSF 372 - Drinking Water System Components - Lead Content; 2024.

**1.02 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.
- C. Maintenance Data: Include fixture trim exploded view and replacement parts lists.
- D. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

**1.03 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

**1.04 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.

**1.05 WARRANTY**

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.

**PART 2 PRODUCTS****2.01 GENERAL REQUIREMENTS**

- A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

**PART 3 EXECUTION****3.01 EXAMINATION**

- A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.
- B. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

**3.02 PREPARATION**

- A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

**3.03 INSTALLATION**

- A. Install each fixture with trap, easily removable for servicing and cleaning.
- B. Install components level and plumb.
- C. Install and secure fixtures in place with wall supports and bolts.

**3.04 INTERFACE WITH WORK OF OTHER SECTIONS**

- A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

**3.05 ADJUSTING**

- A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

**3.06 CLEANING**

- A. Clean plumbing fixtures and equipment.

**3.07 PROTECTION**

- A. Protect installed products from damage due to subsequent construction operations.
- B. Do not permit use of fixtures by construction personnel.
- C. Repair or replace damaged products before Date of Substantial Completion.

**END OF SECTION 224000**

**SECTION 230513  
COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. General construction and requirements.
- B. Applications.
- C. Single phase electric motors.
- D. Three phase electric motors.
- E. Electronically Commutated Motors (ECM).

**1.02 REFERENCE STANDARDS**

- A. NEMA MG 00001 - Motors and Generators; 2024.
- B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

**1.03 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide wiring diagrams with electrical characteristics and connection requirements.
- C. Test Reports: Indicate test results verifying nominal efficiency and power factor for three phase motors larger than 1/2 horsepower.
- D. Manufacturer's Installation Instructions: Indicate setting, mechanical connections, lubrication, and wiring instructions.
- E. Operation Data: Include instructions for safe operating procedures.
- F. Maintenance Data: Include assembly drawings, bearing data including replacement sizes, and lubrication instructions.

**1.04 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacture of electric motors and their accessories, with minimum three years documented product development, testing, and manufacturing experience.
- B. Comply with NFPA 70.
- C. Provide certificate of compliance from Authority Having Jurisdiction indicating approval of high efficiency motors.
- D. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weather-proof covering. For extended outdoor storage, remove motors from equipment and store separately.

#### **1.06 WARRANTY**

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.

### **PART 2 PRODUCTS**

#### **2.01 GENERAL CONSTRUCTION AND REQUIREMENTS**

- A. Construction:
  - 1. Open drip-proof type except where specifically noted otherwise.
  - 2. Design for continuous operation in 104 degrees F (40 degrees C) environment.
  - 3. Design for temperature rise in accordance with NEMA MG 00001 limits for insulation class, service factor, and motor enclosure type.
- B. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, efficiency.
- C. Wiring Terminations:
  - 1. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70, threaded for conduit.
  - 2. For fractional horsepower motors where connection is made directly, provide threaded conduit connection in end frame.

#### **2.02 APPLICATIONS**

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.
- C. Check line voltage and phase and ensure agreement with nameplate.

**END OF SECTION 230513**

**SECTION 230529****HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Support and attachment components.

**1.02 REFERENCE STANDARDS**

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- C. ASTM A181/A181M - Standard Specification for Carbon Steel Forgings, for General-Purpose Piping; 2023.
- D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- E. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2022).
- F. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2018.
- G. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures; 1999 (Reapproved 2022).
- H. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.
- I. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.
- J. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- K. FM (AG) - FM Approval Guide; Current Edition.
- L. MFMA-4 - Metal Framing Standards Publication; 2004.
- M. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).
- N. UL (DIR) - Online Certifications Directory; Current Edition.
- O. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.

2. Coordinate the work with other trades to provide additional framing and materials required for installation.
  3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
  4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
  5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 033000.

#### **1.04 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel (strut) framing systems.
- C. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.
- D. Installer's Qualifications: Include evidence of compliance with specified requirements.
- E. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

#### **1.05 QUALITY ASSURANCE**

- A. Comply with applicable building code.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

#### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

### **PART 2 PRODUCTS**

#### **2.01 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 of \_\_\_\_\_. 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. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
    - b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.
    - c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
    - d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Materials for Metal Fabricated Supports: Comply with Section 055000.
- C. Prefabricated Trapeze-Framed Metal Strut Systems:
1. MFMA-4 compliant, pre-fabricated, MSS SP-58 type 59 continuous-slot metal strut channel with associated tracks, fittings, and related accessories.
  2. MFMA-4 compliant, prefabricated, side-loading continuous-slot metal strut channel bracket with associated tracks, fittings, and related accessories.
  3. Strut Channel or Bracket Material:
    - a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
    - b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.
  4. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch (2.66 mm).
  5. Minimum Channel Dimensions: 1-5/8 inch (41 mm) width by 13/16 inch (21 mm) height.
  6. Accessories: Provide bracket covers, cable basket clips, cable tray clips, clamps, conduit clamps, fire-retarding brackets, j-hooks, protectors, and vibration dampeners.
- D. Strut Channels:
1. ASTM A653/A653M galvanized steel bracket with clamps for surface mounting of piping or plumbing equipment support.
  2. Channel or Bracket Kits: Include rods, brackets, end-fixed fittings, covers, clips, and other related hardware required to complete sectional trapeze section for piping or other support.
- E. Channel Nuts:
1. Provide carbon steel channel nut with epoxy copper or zinc finish and long, regular, or short spring.

- F. Hanger Rods:
1. Threaded zinc-plated steel unless otherwise indicated.
  2. Minimum Size, Unless Otherwise Indicated or Required:
    - a. Equipment Supports: 1/2 inch (13 mm) diameter.
    - b. Piping up to 1 inch (25 mm, DN): 1/4 inch (6 mm) diameter.
    - c. Piping larger than 1 inch (25 mm, DN): 3/8 inch (10 mm) diameter.
    - d. Trapeze Support for Multiple Pipes: 3/8 inch (10 mm) diameter.
- G. Cable Hanging System Kits:
1. Provide cable-wire in bulk or precut lengths with respective cable hangers as required to hold minimum weight of 120 lb (54.4 kg).
  2. Accessories: Provide brackets, clip or c-clip hangers, covers, and y-hook hangers.
- H. Pipe Supports:
1. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.
  2. Liquid Temperatures Up To 122 degrees F (50 degrees C):
    - a. Overhead Support: MSS SP-58 Types 1, 3 through 12.
    - b. Support From Below: MSS SP-58 Types 35 through 38.
  3. Operating Temperatures from 122 to 446 degrees F (50 to 230 degrees C):
    - a. Overhead Support: MSS SP-58 Type 1 or 3 through 12, with appropriate saddle of MSS SP-58 Type 40 for insulated pipe.
- I. Pipe Stanchions:
1. Material: Malleable iron, ASTM A47/A47M; or carbon steel, ASTM A36/A36M.
  2. Provide coated or plated saddles to isolate steel hangers from dissimilar metal tube or pipe.
  3. For pipe runs, use stanchions of same type and material where vertical adjustment is required for stationary pipe.
- J. Beam Clamps:
1. MSS SP-58 types 19 through 23, 25 or 27 through 30 based on required load.
  2. Beam C-Clamp: MSS SP-58 type 23, malleable iron and steel with plain, stainless steel, and zinc finish.
  3. Small or Junior Beam Clamp: MSS SP-58 type 19, malleable iron with plain finish. For inverted usage provide manufacturer listed size(s).
  4. Wide Mouth Beam Clamp: MSS SP-58 type 19, malleable iron with plain finish.
  5. Centerload Beam Clamp with Extension Piece: MSS SP-58 type 30, malleable iron with plain finish.
  6. FM (AG) and UL (DIR) Approved Beam Clamp: MSS SP-58 type 19, plain finish,
  7. Provide clamps with hardened steel cup-point set screws and lock-nuts for anchoring in place.

8. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.
- K. Riser Clamps:
1. For insulated pipe runs, provide two bolt-type clamps designed for installation under insulation.
  2. MSS SP-58 type 1 or 8, carbon steel or steel with epoxy plated, plain, stainless steel, or zinc plated finish.
  3. Medium Split Horizontal Pipe Clamp: MSS SP-58 type 4, carbon steel or stainless steel with epoxy plated, plain, stainless steel, or zinc plated finish.
  4. Copper Tube Pipe Clamp: MSS SP-58 type 8, epoxy plated copper.
  5. UL (DIR) listed: Pipe sizes 1/2 to 8 inch (15 to 200 mm, DN).
- L. U-Bolts:
1. MSS SP-58 Type 24, carbon steel u-bolt for pipe support or anchoring.
- M. Strut Clamps:
1. Pipe Clamp: Two-piece rigid, universal, or outer diameter type, carbon steel with epoxy copper or zinc finish.
  2. Service Temperature Range: Minus 65 to 275 degrees F (Minus 53.8 to 135 degrees C).
- N. Insulation Clamps:
1. Two bolt-type clamps designed for installation under insulation.
  2. Material: Carbon steel with epoxy copper or zinc finish.
- O. Pipe Hangers:
1. Split Ring Hangers:
    - a. Provide hinged split ring and yoke roller hanger with epoxy copper or plain finish.
    - b. Material: ASTM A47/A47M malleable iron or ASTM A36/A36M carbon steel.
    - c. Provide hanger rod and nuts of the same type and material for a given pipe run.
    - d. Provide coated or plated hangers to isolate steel hangers from dissimilar metal tube or pipe.
  2. Swivel Ring Hangers, Adjustable:
    - a. MSS SP-58 Type 10, epoxy-painted, zinc-colored.
    - b. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.
    - c. FM (AG) and UL (DIR) listed for specific pipe size runs and loads.
  3. Clevis Hangers, Adjustable:
    - a. Copper Tube: MSS SP-58 Type 1, epoxy-plated copper.
    - b. Light-Duty: MSS SP-58 Type 1, zinc-colored, epoxy plated.
    - c. Standard-Duty: MSS SP-58 Type 1, zinc-colored, epoxy plated.

- d. UL (DIR) listed: Pipe sizes 2-1/2 to 8 inch (65 to 200 mm, DN).
- P. Nonpenetrating Rooftop Supports for Low-Slope Roofs:
1. Provide steel pedestals with thermoplastic or rubber base that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified.
  2. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
  3. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports.
  4. Mounting Height: Provide minimum clearance of 6 inches (150 mm) under supported component to top of roofing.
- Q. Pipe Shields for Insulated Piping:
1. General Construction and Requirements:
    - a. Surface Burning Characteristics: Comply with ASTM E84 or UL 723.
    - b. Shields Material: UV-resistant polypropylene with glass fill.
    - c. Maximum Insulated Pipe Outer Diameter: 12-5/8 inch (321 mm).
    - d. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
    - e. Maximum Service Temperature: 178 degrees F (81 degrees C).
    - f. Pipe shields to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.
- R. Anchors and Fasteners:
1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
  2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
  3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
  4. Hollow Masonry: Use toggle bolts.
  5. Hollow Stud Walls: Use toggle bolts.
  6. Steel: Use beam-ceiling clamps, beam clamps, machine bolts, or welded threaded studs.
  7. Beam Ceiling Flanges: ASTM A47/A47M Grade 32510, malleable iron or stainless steel with copper, plain, stainless steel, or zinc finish.
  8. Sheet Metal: Use sheet metal screws.
  9. Wood: Use wood screws.
  10. 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.

**PART 3 EXECUTION****3.01 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.

**3.02 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.
- C. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
- D. Unless specifically indicated or approved by Architect, do not provide support from roof deck.
- E. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- F. 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.
- G. Preset Concrete Inserts: Use manufacturer-provided closure strips to inhibit concrete seepage during concrete pour.
- H. Secure fasteners according to manufacturer's recommended torque settings.
- I. Remove temporary supports.

**3.03 FIELD QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements for additional requirements.
- B. Inspect support and attachment components for damage and defects.
- C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- D. Correct deficiencies and replace damaged or defective support and attachment components.

**END OF SECTION 230529**

**SECTION 230553**  
**IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Nameplates.
- B. Tags.
- C. Adhesive-backed duct markers.
- D. Pipe markers.
- E. Ceiling tacks.

**1.02 RELATED REQUIREMENTS**

- A. Section 099123 - Interior Painting: Identification painting.

**1.03 REFERENCE STANDARDS**

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

**1.04 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.
- C. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
- D. Product Data: Provide manufacturers catalog literature for each product required.
- E. Manufacturer's Installation Instructions: Indicate special procedures, and installation.
- F. Project Record Documents: Record actual locations of tagged valves.

**PART 2 PRODUCTS****2.01 IDENTIFICATION APPLICATIONS**

- A. Air Handling Units: Nameplates.
- B. Automatic Controls: Tags. Key to control schematic.
- C. Control Panels: Nameplates.
- D. Dampers: Ceiling tacks, where located above lay-in ceiling.
- E. Ductwork: Nameplates.
- F. Piping: Tags.
- G. Pumps: Nameplates.
- H. Small-sized Equipment: Tags.
- I. Valves: Tags and ceiling tacks where located above lay-in ceiling.

## 2.02 NAMEPLATES

- A. Manufacturers:
  - 1. Advanced Graphic Engraving, LLC: [www.advancedgraphicengraving.com/#sle](http://www.advancedgraphicengraving.com/#sle).
  - 2. Brimar Industries, Inc: [www.pipemarker.com/#sle](http://www.pipemarker.com/#sle).
  - 3. Craftmark Pipe Markers: [www.craftmarkid.com/#sle](http://www.craftmarkid.com/#sle).
  - 4. Kolbi Pipe Marker Co: [www.kolbipipemarkers.com/#sle](http://www.kolbipipemarkers.com/#sle).
  - 5. Seton Identification Products, a Tricor Direct Company: [www.seton.com/#sle](http://www.seton.com/#sle).
  - 6. Substitutions: See Section 016000 - Product Requirements.
- B. Letter Color: White.
- C. Letter Height: 1/4 inch (6 mm).
- D. Background Color: Black.
- E. Plastic: Comply with ASTM D709.

## 2.03 TAGS

- A. Manufacturers:
  - 1. Advanced Graphic Engraving: [www.advancedgraphicengraving.com/#sle](http://www.advancedgraphicengraving.com/#sle).
  - 2. Brady Corporation: [www.bradycorp.com/#sle](http://www.bradycorp.com/#sle).
  - 3. Brimar Industries, Inc: [www.pipemarker.com/#sle](http://www.pipemarker.com/#sle).
  - 4. Craftmark Pipe Markers: [www.craftmarkid.com/#sle](http://www.craftmarkid.com/#sle).
  - 5. Kolbi Pipe Marker Co: [www.kolbipipemarkers.com/#sle](http://www.kolbipipemarkers.com/#sle).
  - 6. Seton Identification Products, a Tricor Company: [www.seton.com/#sle](http://www.seton.com/#sle).
  - 7. Substitutions: See Section 016000 - Product Requirements.
- B. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch (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.

## 2.04 ADHESIVE-BACKED DUCT MARKERS

- A. Manufacturers:
  - 1. Brimar Industries, Inc: [www.pipemarker.com/#sle](http://www.pipemarker.com/#sle).
  - 2. Craftmark Pipe Markers: [www.craftmarkid.com/#sle](http://www.craftmarkid.com/#sle).
  - 3. Kolbi Pipe Marker Co: [www.kolbipipemarkers.com/#sle](http://www.kolbipipemarkers.com/#sle).
  - 4. Substitutions: See Section 016000 - Product Requirements.
- 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.

## 2.05 PIPE MARKERS

- A. Manufacturers:
  - 1. Brady Corporation: [www.bradycorp.com/#sle](http://www.bradycorp.com/#sle).
  - 2. Brimar Industries, Inc: [www.pipemarker.com/#sle](http://www.pipemarker.com/#sle).
  - 3. Craftmark Pipe Markers: [www.craftmarkid.com/#sle](http://www.craftmarkid.com/#sle).
  - 4. Kolbi Pipe Marker Co: [www.kolbipipemarkers.com/#sle](http://www.kolbipipemarkers.com/#sle).
  - 5. Seton Identification Products, a Tricor Company: [www.seton.com/#sle](http://www.seton.com/#sle).
  - 6. Substitutions: See Section 016000 - Product Requirements.
- 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.
- D. Color code as follows:
  - 1. Heating, Cooling, and Boiler Feedwater: Green with white letters.
  - 2. Toxic and Corrosive Fluids: Orange with black letters.

## 2.06 CEILING TACKS

- A. Manufacturers:
  - 1. Craftmark Pipe Markers: [www.craftmarkid.com/#sle](http://www.craftmarkid.com/#sle).
  - 2. Substitutions: See Section 016000 - Product Requirements.
- 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

### 3.01 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.
- B. Prepare surfaces in accordance with Section 099123 for stencil painting.

### 3.02 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. 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 or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

**END OF SECTION 230553**

**SECTION 230593**  
**TESTING, ADJUSTING, AND BALANCING FOR HVAC**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Testing, adjustment, and balancing of air systems.
- B. Measurement of final operating condition of HVAC systems.
- C. Commissioning activities.

**1.02 RELATED REQUIREMENTS**

- A. Section 014000 - Quality Requirements: Employment of testing agency and payment for services.
- B. Section 019113 - General Commissioning Requirements: Commissioning requirements that apply to all types of work.
- C. Section 230800 - Commissioning of HVAC.

**1.03 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; 2024.
- C. NEBB (TAB) - Procedural Standard for Testing, Adjusting and Balancing of Environmental Systems; 2019, with Errata (2022).
- D. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing; 2023.

**1.04 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
  - 1. Submit to the Commissioning Authority.
  - 2. Submit six weeks prior to starting the testing, adjusting, and balancing work.
  - 3. Include at least the following in the plan:
    - a. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
    - b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
    - c. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
    - d. Final test report forms to be used.

- e. Procedures for formal deficiency reports, including scope, frequency and distribution.
- C. Field Logs: Submit at least twice a week to the Commissioning Authority.
- D. Control System Coordination Reports: Communicate in writing to the controls installer all setpoint and parameter changes made or problems and discrepancies identified during TAB that affect, or could affect, the control system setup and operation.
- E. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
  - 1. Submit to the the Commissioning Authority within two weeks after completion of testing, adjusting, and balancing.
  - 2. Revise TAB plan to reflect actual procedures and submit as part of final report.
  - 3. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect and for inclusion in operating and maintenance manuals.
  - 4. Provide reports in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations. Provide additional PDF of same.
  - 5. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
  - 6. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
  - 7. Units of Measure: Report data in I-P (inch-pound) units only.

## **PART 2 PRODUCTS - NOT USED**

## **PART 3 EXECUTION**

### **3.01 GENERAL REQUIREMENTS**

- A. Perform total system balance in accordance with one of the following:
  - 1. AABC (NSTSB), AABC National Standards for Total System Balance.
  - 2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
  - 3. SMACNA (TAB).
  - 4. Maintain at least one copy of the standard to be used at project site at all times.
- B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.
- C. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.
- D. TAB Agency Qualifications:

1. Company specializing in the testing, adjusting, and balancing of systems specified in this section. See approved T and B contractors above.
2. Certified by one of the following:
  - a. AABC, Associated Air Balance Council: [www.aabc.com/#sle](http://www.aabc.com/#sle); upon completion submit AABC National Performance Guaranty.
  - b. NEBB, National Environmental Balancing Bureau: [www.nebb.org/#sle](http://www.nebb.org/#sle).
  - c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: [www.tabbcertified.org/#sle](http://www.tabbcertified.org/#sle).
- E. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

### 3.02 EXAMINATION

- A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
  1. Systems are started and operating in a safe and normal condition.
  2. Temperature control systems are installed complete and operable.
  3. Proper thermal overload protection is in place for electrical equipment.
  4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
  5. Duct systems are clean of debris.
  6. Fans are rotating correctly.
  7. Fire and volume dampers are in place and open.
  8. Air coil fins are cleaned and combed.
  9. Access doors are closed and duct end caps are in place.
  10. Air outlets are installed and connected.
  11. Duct system leakage is minimized.
  12. Pumps are rotating correctly.
  13. Proper strainer baskets are clean and in place.
  14. Service and balance valves are open.
- B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.
- C. Beginning of work means acceptance of existing conditions.

### 3.03 PREPARATION

- A. Hold a pre-balancing meeting at least one week prior to starting TAB work.
  1. Require attendance by all installers whose work will be tested, adjusted, or balanced.
- B. Provide additional balancing devices as required.

### 3.04 ADJUSTMENT TOLERANCES

- A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.

- B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.
- C. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

### 3.05 RECORDING AND ADJUSTING

- A. Field Logs: Maintain written logs including:
  - 1. Running log of events and issues.
  - 2. Discrepancies, deficient or uncompleted work by others.
  - 3. Contract interpretation requests.
  - 4. Lists of completed tests.
- B. Ensure recorded data represents actual measured or observed conditions.
- C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- D. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- E. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

### 3.06 AIR SYSTEM PROCEDURE

- A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.
- B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.
- C. Measure air quantities at air inlets and outlets.
- D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.
- E. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.
- F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.
- G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.
- H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.
- I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

- J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.
- K. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.
- L. For variable air volume system powered units set volume controller to air flow setting indicated. Confirm connections properly made and confirm proper operation for automatic variable air volume temperature control.
- M. On fan powered VAV boxes, adjust air flow switches for proper operation.

### 3.07 WATER SYSTEM PROCEDURE

- A. Adjust water systems to provide required or design quantities.
- B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gauges to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.
- C. Adjust systems to provide specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.
- D. Effect system balance with automatic control valves fully open to heat transfer elements.
- E. Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.
- F. Where available pump capacity is less than total flow requirements or individual system parts, full flow in one part may be simulated by temporary restriction of flow to other parts.

### 3.08 COMMISSIONING

- A. See Sections 019113 - General Commissioning Requirements and 230800 for additional requirements.
- B. Perform prerequisites prior to starting commissioning activities.
- C. Fill out Prefunctional Checklists for:
  - 1. Air side systems.
  - 2. Water side systems.
- D. Furnish to the Commissioning Authority, upon request, any data gathered but not shown in the final TAB report.
- E. Re-check minimum outdoor air intake flows and maximum and intermediate total airflow rates for \_\_\_ percent of the air handlers plus a random sample equivalent to \_\_\_ percent of the final TAB report data as directed by Commissioning Authority.

1. Original TAB agency shall execute the re-checks, witnessed by the Commissioning Authority.
  2. Use the same test instruments as used in the original TAB work.
  3. Failure of more than 10 percent of the re-checked items of a given system shall result in the rejection of the system TAB report; rebalance the system, provide a new system TAB report, and repeat random re-checks.
  4. For purposes of re-check, failure is defined as follows:
    - a. Air Flow of Supply and Return: Deviation of more than 10 percent of instrument reading.
    - b. Minimum Outside Air Flow: Deviation of more than 20 percent of instrument reading; for inlet vane or VFD OSA compensation system using linear proportional control, deviation of more than 30 percent at intermediate supply flow.
    - c. Temperatures: Deviation of more than one degree F (0.5 degree C).
    - d. Air and Water Pressures: Deviation of more than 10 percent of full scale of test instrument reading.
    - e. Sound Pressures: Deviation of more than 3 decibels, with consideration for variations in background noise.
  5. For purposes of re-check, a whole system is defined as one in which inaccuracies will have little or no impact on connected systems; for example, the air distribution system served by one air handler or the hydronic chilled water supply system served by a chiller or the condenser water system.
- F. In the presence of the Commissioning Authority, verify that:
1. Final settings of all valves, splitters, dampers and other adjustment devices have been permanently marked.
  2. The air system is being controlled to the lowest possible static pressure while still meeting design loads, less diversity; this shall include a review of TAB methods, established control setpoints, and physical verification of at least one leg from fan to diffuser having all balancing dampers wide open and that during full cooling of all terminal units taking off downstream of the static pressure sensor, the terminal unit on the critical leg has its damper 90 percent or more open.
  3. The water system is being controlled to the lowest possible pressure while still meeting design loads, less diversity; this shall include a review of TAB methods, established control setpoints, and physical verification of at least one leg from the pump to the coil having all balancing valves wide open and that during full cooling the cooling coil valve of that leg is 90 percent or more open.

### 3.09 SCOPE

- A. Test, adjust, and balance the following:
1. Plumbing Pumps.
  2. Packaged Roof Top Heating/Cooling Units.
  3. Packaged Terminal Air Conditioning Units.
  4. Fans.

5. Air Filters.
6. Air Inlets and Outlets.

### 3.10 MINIMUM DATA TO BE REPORTED

#### A. Electric Motors:

1. Manufacturer.
2. Model/Frame.
3. HP/BHP.
4. Phase, voltage, amperage; nameplate, actual, no load.
5. RPM.
6. Service factor.
7. Starter size, rating, heater elements.
8. Sheave Make/Size/Bore.

#### B. V-Belt Drives:

1. Identification/location.
2. Required driven RPM.
3. Driven sheave, diameter and RPM.
4. Belt, size and quantity.
5. Motor sheave diameter and RPM.
6. Center to center distance, maximum, minimum, and actual.

#### C. Pumps:

1. Identification/number.
2. Manufacturer.
3. Size/model.
4. Impeller.
5. Service.
6. Design flow rate, pressure drop, BHP.
7. Actual flow rate, pressure drop, BHP.
8. Discharge pressure.
9. Suction pressure.
10. Total operating head pressure.
11. Shut off, discharge and suction pressures.
12. Shut off, total head pressure.

#### D. Air Cooled Condensers:

1. Identification/number.
2. Location.
3. Manufacturer.
4. Model number.
5. Serial number.
6. Entering DB air temperature, design and actual.
7. Leaving DB air temperature, design and actual.

8. Number of compressors.
- E. Air Moving Equipment:
1. Location.
  2. Manufacturer.
  3. Model number.
  4. Serial number.
  5. Arrangement/Class/Discharge.
  6. Air flow, specified and actual.
  7. Return air flow, specified and actual.
  8. Outside air flow, specified and actual.
  9. Total static pressure (total external), specified and actual.
  10. Inlet pressure.
  11. Discharge pressure.
  12. Sheave Make/Size/Bore.
  13. Number of Belts/Make/Size.
  14. Fan RPM.
- F. Return Air/Outside Air:
1. Identification/location.
  2. Design air flow.
  3. Actual air flow.
  4. Design return air flow.
  5. Actual return air flow.
  6. Design outside air flow.
  7. Actual outside air flow.
  8. Return air temperature.
  9. Outside air temperature.
  10. Required mixed air temperature.
  11. Actual mixed air temperature.
  12. Design outside/return air ratio.
  13. Actual outside/return air ratio.
- G. Exhaust Fans:
1. Location.
  2. Manufacturer.
  3. Model number.
  4. Serial number.
  5. Air flow, specified and actual.
  6. Total static pressure (total external), specified and actual.
  7. Inlet pressure.
  8. Discharge pressure.
  9. Sheave Make/Size/Bore.

10. Number of Belts/Make/Size.
11. Fan RPM.

H. Air Distribution Tests:

1. Air terminal number.
2. Room number/location.
3. Terminal type.
4. Terminal size.
5. Design air flow.
6. Test (final) air flow.
7. Percent of design air flow.

**END OF SECTION 230593**

**SECTION 230713  
DUCT INSULATION**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Duct insulation.
- B. Duct liner.
- C. Weather barrier coatings.
- D. Jacketing and accessories.

**1.02 REFERENCE STANDARDS**

- A. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.
- B. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2023.
- C. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013 (Reapproved 2019).
- D. ASTM C916 - Standard Specification for Adhesives for Duct Thermal Insulation; 2020.
- E. ASTM C1338 - Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings; 2019 (Reapproved 2022).
- F. ASTM C1371 - Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers; 2015 (Reapproved 2022).
- G. ASTM C1423 - Standard Guide for Selecting Jacketing Materials for Thermal Insulation; 2021.
- H. ASTM C1775 - Standard Specification for Laminate Protective Jacket and Tape for Use Over Thermal Insulation for Outdoor Applications; 2022.
- I. ASTM D5590 - Standard Test Method for Determining the Resistance of Paint Films and Related Coatings to Fungal Defacement by Accelerated Four-Week Agar Plate Assay; 2017 (Reapproved 2021).
- J. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- K. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.
- L. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).
- M. SAE AMS3779 - Tape, Adhesive, Pressure-Sensitive Thermal Radiation Resistant, Aluminum Coated Glass Cloth; 2016b.
- N. UL 181A - Closure Systems for Use with Rigid Air Ducts; Current Edition, Including All Revisions.

- O. UL 181B - Closure Systems for Use with Flexible Air Ducts and Air Connectors; Current Edition, Including All Revisions.
- P. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

### **1.03 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.
- C. Manufacturer's Instructions: Indicate installation procedures necessary to ensure acceptable workmanship and that installation standards will be achieved.

### **1.04 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than three years of documented experience.

### **1.05 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.

### **1.06 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**

### **2.01 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.

### **2.02 GLASS FIBER, FLEXIBLE**

- A. Manufacturer:
  - 1. CertainTeed Corporation: [www.certainteed.com/#sle](http://www.certainteed.com/#sle).
  - 2. Johns Manville: [www.jm.com/#sle](http://www.jm.com/#sle).
  - 3. JP Lamborn Co; Thermal Sleeve MT: [www.jpflex.com/#sle](http://www.jpflex.com/#sle).
  - 4. Knauf Insulation; Performance+ Duct Wrap: [www.knaufinsulation.com/#sle](http://www.knaufinsulation.com/#sle).
  - 5. Manson Insulation, a company of Knauf Insulation; Alley Wrap B: [www.imanson.com/#sle](http://www.imanson.com/#sle).
  - 6. Substitutions: See Section 016000 - Product Requirements.
- B. Insulation: ASTM C553; flexible, noncombustible blanket.
- C. Vapor Barrier Tape:

1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure-sensitive rubber-based adhesive.
- D. Indoor Vapor Barrier Mastic:
1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

### 2.03 WEATHER BARRIER COATINGS

- A. Weather-Resistive Barrier Coating: Fire-resistive, UV resistant, water-based mastic for use over closed cell polyethylene and polyurethane foam insulation; applied with glass fiber or synthetic reinforcing mesh.
1. Manufacturers:
    - a. H.B. Fuller Construction Products, Inc; Childers - CP Series Weather Barrier Coating: [www.fosterproducts.com/#sle](http://www.fosterproducts.com/#sle).
  2. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less, Class A, when tested in accordance with ASTM E84.
  3. Water Vapor Permeance: Greater than 1.0 perm (57 ng/(Pa s m)) in accordance with ASTM E96/E96M.
  4. Resistance to Fungal Growth: No growth when tested in accordance with ASTM D5590.
  5. Color: As selected by Architect.

### 2.04 JACKETING AND ACCESSORIES

- A. Aluminum Jacket:
1. Comply with ASTM B209/B209M, Temper H14, minimum thickness of 0.016 inch (0.41 mm) with factory-applied polyethylene and kraft paper moisture barrier on the inside surface.
  2. Thickness: 0.016 inch (0.40 mm) sheet.
  3. Finish: Smooth.
  4. Joining: Longitudinal slip joints and 2 inch (50 mm) laps.
  5. Fittings: 0.016 inch (0.40 mm) thick die-shaped fitting covers with factory-attached protective liner.
  6. Metal Jacket Bands: 3/8 inch (10 mm) wide; 0.015 inch (0.38 mm) thick aluminum.
- B. Aluminum-Foil Laminate Jacket:
1. Manufacturers:
    - a. Ideal Tape Co., Inc: [www.idealtape.com/#sle](http://www.idealtape.com/#sle).
  2. Factory-applied, pressure sensitive adhesive jacketing on paper release liner.
  3. Comply with ASTM C1775.
- C. Aluminum-Foil Laminate Jacket:
1. Manufacturers:
    - a. H.B. Fuller Construction Products, Inc; Foster - Vapor-Fas: [www.fosterproducts.com/#sle](http://www.fosterproducts.com/#sle).

2. Factory-applied, pressure sensitive adhesive jacketing to comply with ASTM C1775.
- D. Flexible Weather-Proofing Outdoor Jacket: Self-healing, field-applied outdoor cladding.
1. Material: Aluminum foil/polymer laminate with rubberized asphalt layer and acrylic adhesive.
  2. Thickness: 34 mil, 0.034 inch (0.86 mm).
  3. Finish: Embossed.
  4. Color: Silver.
  5. Water Vapor Transmission: 0.002 perm inch (0.0029 ng/(Pa s m)), maximum, when tested in accordance with ASTM E96/E96M.
  6. Mold Resistance: Pass when tested in accordance with ASTM C1338.
  7. Emissivity: 0.30 when tested in accordance with ASTM C1371.
  8. Manufacturers:
    - a. Polyguard Products; Alumaguard: [www.polyguardproducts.com.com/#sle](http://www.polyguardproducts.com.com/#sle).
- E. Reinforced Tape:
1. Manufacturers:
    - a. Ideal Tape Co., Inc: [www.idealtape.com/#sle](http://www.idealtape.com/#sle).
    - b. Substitutions: See Section 016000 - Product Requirements.
  2. FSK tape suitable for sealing seams between insulation, insulated elbows, and fittings resulting in a tight, smooth surface without wrinkles.
  3. Comply with UL 723 or ASTM E84.
  4. Moisture Vapor Permeability: 0.00 perm inch (0.00 ng/(Pa s m)), when tested in accordance with ASTM E96/E96M.
- F. Plain Foil Tape:
1. Manufacturers:
    - a. Ideal Tape Co., Inc: [www.idealtape.com/#sle](http://www.idealtape.com/#sle).
    - b. Substitutions: See Section 016000 - Product Requirements.
  2. Aluminum foil with pressure-sensitive adhesive on paper release liner.
  3. Finish: Plain foil.
- G. UL181 Tape for Rigid and Flexible Ductwork:
1. Manufacturers:
    - a. Ideal Tape Co., Inc: [www.idealtape.com/#sle](http://www.idealtape.com/#sle).
    - b. Substitutions: See Section 016000 - Product Requirements.
  2. Comply with UL 181A for rigid ductwork.
  3. Comply with UL 181B for flexible ductwork.
  4. Aluminum foil coated with pressure-sensitive adhesive on paper release liner.
  5. Foil tape suitable for sealing seams between insulation, insulated elbows, and fittings resulting in a tight, smooth surface without wrinkles.
  6. Finish: Printed with UL Listing for identification.

## 2.05 DUCT LINER

- A. Manufacturers:
1. Aeroflex USA; AEROFLEX Breathe-EZ: [www.aeroflexusa.com/#sle](http://www.aeroflexusa.com/#sle).
  2. Armacell LLC; ArmaFlex Ultra with FlameDefense: [www.armacell.us/#sle](http://www.armacell.us/#sle).
  3. CertainTeed Corporation: [www.certainteed.com/#sle](http://www.certainteed.com/#sle).
  4. Ductmate Industries, Inc, a DMI Company: [www.ductmate.com/#sle](http://www.ductmate.com/#sle).
  5. Johns Manville: [www.jm.com/#sle](http://www.jm.com/#sle).
  6. Knauf Insulation; Performance+ Duct Liner: [www.knaufinsulation.com/#sle](http://www.knaufinsulation.com/#sle).
  7. Manson Insulation, a company of Knauf Insulation; Akousti-Liner:  
[www.imanson.com/#sle](http://www.imanson.com/#sle).
  8. Owens Corning Corporation; QuietR Rotary Duct Insulation:  
[www.owenscorning.com/en-us/#sle](http://www.owenscorning.com/en-us/#sle).
- B. Note: Choose the liner type - Elastomeric Foam, Glass Fiber, or Phenolic Foam.
- 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.
  4. Apparent Thermal Conductivity: Maximum of 0.28 at 75 degrees F (0.045 at 24 degrees C).
  5. Minimum Noise Reduction Coefficients:
    - a. 1 inch (25 mm) Thickness: 0.40.
  6. Connection: Waterproof vapor barrier adhesive.
- D. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation. Comply with ASTM C916.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Test ductwork for design pressure prior to applying insulation materials.
- B. Verify that surfaces are clean, foreign material removed, and dry.

### 3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NAIMA National Insulation Standards.
- C. Insulated Ducts Conveying Air Below Ambient Temperature:
  1. Provide insulation with vapor barrier jackets.
  2. Finish with tape and vapor barrier jacket.
  3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
  4. Insulate entire system, including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

- D. 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.

### **3.03 SCHEDULES**

- A. Exhaust Ducts Within 10 ft (3 m) of Exterior Openings:
- B. Outside Air Intake Ducts:
- C. Supply Ducts:
- D. Supply Ducts From Fans to Vertical Ducts in Shafts (Cooling System):
- E. Supply Ducts in Vertical Shafts (Cooling Systems):
- F. Ducts Exposed to Outdoors:

**END OF SECTION 230713**

**SECTION 230800**  
**COMMISSIONING OF HVAC**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. See Section 019113 - General Commissioning Requirements for overall objectives; comply with the requirements of Section 019113.
- B. This section covers the Contractor's responsibilities for commissioning; each subcontractor or installer responsible for the installation of a particular system or equipment item to be commissioned is responsible for the commissioning activities relating to that system or equipment item.
- C. The Commissioning Authority (CA) directs and coordinates all commissioning activities and provides Prefunctional Checklists and Functional Test Procedures for Contractor's use.
- D. The entire HVAC system is to be commissioned, including commissioning activities for the following specific items:
  - 1. Other equipment and systems explicitly identified elsewhere in Contract Documents as requiring commissioning.
- E. The Prefunctional Checklist and Functional Test requirements specified in this section are in addition to, not a substitute for, inspection or testing specified in other sections.

**1.02 REFERENCE STANDARDS**

- A. ASHRAE Guideline 1.1 - Application of the Commissioning Process to New HVAC&R Systems; 2025.

**1.03 SUBMITTALS**

- A. Updated Submittals: Keep the Commissioning Authority informed of all changes to control system documentation made during programming and setup; revise and resubmit when substantial changes are made.
- B. Startup Reports, Prefunctional Checklists, and Trend Logs: Submit for approval of Commissioning Authority.
- C. HVAC Control System O&M Manual Requirements. In addition to documentation specified elsewhere, compile and organize at minimum the following data on the control system:
  - 1. Specific step-by-step instructions on how to perform and apply all functions, features, modes, etc. mentioned in the controls training sections of this specification and other features of this system. Provide an index and clear table of contents. Include the detailed technical manual for programming and customizing control loops and algorithms.
  - 2. Full as-built set of control drawings.
  - 3. Full as-built sequence of operations for each piece of equipment.

4. Full points list; in addition to the information on the original points list submittal, include a listing of all rooms with the following information for each room:
    - a. Floor.
    - b. Room number.
    - c. Room name.
    - d. Air handler unit ID.
    - e. Reference drawing number.
    - f. Air terminal unit tag ID.
    - g. Heating and/or cooling valve tag ID.
    - h. Minimum air flow rate.
    - i. Maximum air flow rate.
  5. Full print out of all schedules and set points after testing and acceptance of the system.
  6. Full as-built print out of software program.
  7. Electronic copy on disk of the entire program for this facility.
  8. Marking of all system sensors and thermostats on the as-built floor plan and HVAC drawings with their control system designations.
  9. Maintenance instructions, including sensor calibration requirements and methods by sensor type, etc.
  10. Control equipment component submittals, parts lists, etc.
  11. Warranty requirements.
  12. Copies of all checkout tests and calibrations performed by the Contractor (not commissioning tests).
  13. Organize and subdivide the manual with permanently labeled tabs for each of the following data in the given order:
    - a. Sequences of operation.
    - b. Control drawings.
    - c. Points lists.
    - d. Controller and/or module data.
    - e. Thermostats and timers.
    - f. Sensors and DP switches.
    - g. Valves and valve actuators.
    - h. Dampers and damper actuators.
    - i. Program setups (software program printouts).
- D. Project Record Documents: See Section 017800 for additional requirements.
1. Submit updated version of control system documentation, for inclusion with operation and maintenance data.
  2. Show actual locations of all static and differential pressure sensors (air, water and building pressure) and air-flow stations on project record drawings.
- E. Draft Training Plan: In addition to requirements specified in Section 017900, include:
1. Follow the recommendations of ASHRAE Guideline 1.1.

2. Control system manufacturer's recommended training.
  3. Demonstration and instruction on function and overrides of any local packaged controls not controlled by the HVAC control system.
- F. Training Manuals: See Section 017900 for additional requirements.
1. Provide three extra copies of the controls training manuals in a separate manual from the O&M manuals.

## **PART 2 PRODUCTS**

### **2.01 TEST EQUIPMENT**

- A. Provide all standard testing equipment required to perform startup and initial checkout and required functional performance testing; unless otherwise noted such testing equipment will NOT become the property of Owner.
- B. Equipment-Specific Tools: Where special testing equipment, tools and instruments are specific to a piece of equipment, are only available from the vendor, and are required in order to accomplish startup or Functional Testing, provide such equipment, tools, and instruments as part of the work at no extra cost to Owner; such equipment, tools, and instruments are to become the property of Owner.

## **PART 3 EXECUTION**

### **3.01 PREPARATION**

- A. Cooperate with the Commissioning Authority in development of the Prefunctional Checklists and Functional Test Procedures.
- B. Furnish additional information requested by the Commissioning Authority.
- C. Prepare a preliminary schedule for HVAC pipe and duct system testing, flushing and cleaning, equipment start-up and testing, adjusting, and balancing start and completion for use by the Commissioning Authority; update the schedule as appropriate.
- D. Notify the Commissioning Authority when pipe and duct system testing, flushing, cleaning, startup of each piece of equipment and testing, adjusting, and balancing will occur; when commissioning activities not yet performed or not yet scheduled will delay construction notify ahead of time and be proactive in seeing that the Commissioning Authority has the scheduling information needed to efficiently execute the commissioning process.
- E. Put all HVAC equipment and systems into operation and continue operation during each working day of testing, adjusting, and balancing and commissioning, as required.
- F. Provide test holes in ducts and plenums where directed to allow air measurements and air balancing; close with an approved plug.
- G. Provide temperature and pressure taps in accordance with Contract Documents.

### 3.02 INSPECTING AND TESTING - GENERAL

- A. Submit startup plans, startup reports, and Prefunctional Checklists for each item of equipment or other assembly to be commissioned.
- B. Perform the Functional Tests directed by the Commissioning Authority for each item of equipment or other assembly to be commissioned.
- C. Provide two-way radios for use during the testing.
- D. Valve/Damper Stroke Setup and Check:
  - 1. For all valve/damper actuator positions checked, verify the actual position against the control system readout.
  - 2. Set pump/fan to normal operating mode.
  - 3. Command valve/damper closed; visually verify that valve/damper is closed and adjust output zero signal as required.
  - 4. Command valve/damper open; verify position is full open and adjust output signal as required.
  - 5. Command valve/damper to a few intermediate positions.
  - 6. If actual valve/damper position does not reasonably correspond, replace actuator or add pilot positioner (for pneumatics).
- E. Isolation Valve or System Valve Leak Check: For valves not by coils.
  - 1. With full pressure in the system, command valve closed.
  - 2. Use an ultra-sonic flow meter to detect flow or leakage.
- F. Deficiencies: Correct deficiencies and re-inspect or re-test, as applicable, at no extra cost to Owner.

### 3.03 TAB COORDINATION

- A. TAB: Testing, adjusting, and balancing of HVAC.
- B. Coordinate commissioning schedule with TAB schedule.
- C. Review the TAB plan to determine the capabilities of the control system toward completing TAB.
- D. Provide all necessary unique instruments and instruct the TAB technicians in their use; such as handheld control system interface for setting terminal unit boxes, etc.
- E. Have all required Prefunctional Checklists, calibrations, startup and component Functional Tests of the system completed and approved by the Commissioning Authority prior to starting TAB.
- F. Provide a qualified control system technician to operate the controls to assist the TAB technicians or provide sufficient training for the TAB technicians to operate the system without assistance.

### 3.04 CONTROL SYSTEM FUNCTIONAL TESTING

- A. Prefunctional Checklists for control system components will require a signed and dated certification that all system programming is complete as required to accomplish

the requirements of Contract Documents and the detailed Sequences of Operation documentation submittal.

- B. Do not start Functional Testing until all controlled components have themselves been successfully Functionally Tested in accordance with Contract Documents.
- C. Using a skilled technician who is familiar with this building, execute the Functional Testing of the control system as required by the Commissioning Authority.
- D. Functional Testing of the control system constitutes demonstration and trend logging of control points monitored by the control system.
  - 1. The scope of trend logging is partially specified; trend log up to 50 percent more points than specified at no extra cost to Owner.
  - 2. Perform all trend logging specified in Prefunctional Checklists and Functional Test procedures.
- E. Functionally Test integral or stand-alone controls in conjunction with the Functional Tests of the equipment they are attached to, including any interlocks with other equipment or systems; further testing during control system Functional Test is not required unless specifically indicated below.
- F. Demonstrate the following to the Commissioning Authority during testing of controlled equipment; coordinate with commissioning of equipment.
  - 1. Setpoint changing features and functions.
  - 2. Sensor calibrations.
- G. Demonstrate to the Commissioning Authority:
  - 1. That all specified functions and features are set up, debugged and fully operable.
  - 2. That scheduling features are fully functional and setup, including holidays.
  - 3. That all graphic screens and value readouts are completed.
  - 4. Correct date and time setting in central computer.
  - 5. That field panels read the same time as the central computer; sample 10 percent of field panels; if any of those fail, sample another 10 percent; if any of those fail test all remaining units at no extra cost to Owner.
  - 6. Functionality of field panels using local operator keypads and local ports (plugins) using portable computer/keypad; demonstrate 100 percent of panels and 10 percent of ports; if any ports fail, sample another 10 percent; if any of those fail, test all remaining units at no extra cost to Owner.
  - 7. Power failure and battery backup and power-up restart functions.
  - 8. Global commands features.
  - 9. Security and access codes.
  - 10. Occupant over-rides (manual, telephone, key, keypad, etc.).
  - 11. O&M schedules and alarms.
  - 12. Occupancy sensors and controls.
  - 13. All control strategies and sequences not tested during controlled equipment testing.

- H. If the control system, integral control components, or related equipment do not respond to changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice, under any of the conditions, sequences, or modes tested, correct all systems, equipment, components, and software required at no additional cost to Owner.

### **3.05 OPERATION AND MAINTENANCE MANUALS**

- A. See Section 017800 for additional requirements.
- B. Add design intent documentation furnished by Architect to manuals prior to submission to Owner.
- C. Submit manuals related to items that were commissioned to Commissioning Authority for review; make changes recommended by Commissioning Authority.
- D. Commissioning Authority will add commissioning records to manuals after submission to Owner.

### **3.06 DEMONSTRATION AND TRAINING**

- A. See Section 017900 for additional requirements.
- B. Demonstrate operation and maintenance of HVAC system to Owner' personnel; if during any demonstration, the system fails to perform in accordance with the information included in the O&M manual, stop demonstration, repair or adjust, and repeat demonstration. Demonstrations may be combined with training sessions if appropriate.
- C. These demonstrations are in addition to, and not a substitute for, Prefunctional Checklists and demonstrations to the Commissioning Authority during Functional Testing.
- D. Provide classroom and hands-on training of Owner's designated personnel on operation and maintenance of the HVAC system, control system, and all equipment items indicated to be commissioned. Provide the following minimum durations of training:
- E. TAB Review: Instruct Owner's personnel for minimum \_\_\_\_ hours, after completion of TAB, on the following:
  - 1. Review final TAB report, explaining the layout and meanings of each data type.
  - 2. Discuss any outstanding deficient items in control, ducting or design that may affect the proper delivery of air or water.
  - 3. Identify and discuss any terminal units, duct runs, diffusers, coils, fans and pumps that are close to or are not meeting their design capacity.
  - 4. Discuss any temporary settings and steps to finalize them for any areas that are not finished.
  - 5. Other salient information that may be useful for facility operations, relative to TAB.
- F. HVAC Control System Training: Perform training in at least three phases:

1. Phase 1 - Basic Control System: Provide minimum of \_\_\_\_ hours of actual training on the control system itself. Upon completion of training, each attendee, using appropriate documentation, should be able to perform elementary operations and describe general hardware architecture and functionality of the system.
    - a. This training may be held on-site or at the manufacturer's facility.
    - b. If held off-site, the training may occur prior to final completion of the system installation.
    - c. For off-site training, Contractor shall pay expenses of up to two attendees.
  2. Phase 2 - Integrating with HVAC Systems: Provide minimum of \_\_\_\_ hours of on-site, hands-on training after completion of Functional Testing. Include instruction on:
    - a. The specific hardware configuration of installed systems in this facility and specific instruction for operating the installed system, including interfaces with other systems, if any.
    - b. Security levels, alarms, system start-up, shut-down, power outage and restart routines, changing setpoints and alarms and other typical changed parameters, overrides, freeze protection, manual operation of equipment, optional control strategies that can be considered, energy savings strategies and set points that if changed will adversely affect energy consumption, energy accounting, procedures for obtaining vendor assistance, etc.
    - c. Trend logging and monitoring features (values, change of state, totalization, etc.), including setting up, executing, downloading, viewing both tabular and graphically and printing trends; provide practice in setting up trend logging and monitoring during training session.
    - d. Every display screen, allowing time for questions.
    - e. Point database entry and modifications.
  3. Phase 3 - Post-Occupancy: Six months after occupancy conduct minimum of \_\_\_\_ hours of training. Tailor training session to questions and topics solicited beforehand from Owner. Also be prepared to address topics brought up and answer questions concerning operation of the system.
- G. Provide the services of manufacturer representatives to assist instructors where necessary.
- H. Provide the services of the HVAC controls instructor at other training sessions, when requested, to discuss the interaction of the controls system as it relates to the equipment being discussed.

**END OF SECTION 230800**

**SECTION 230913  
INSTRUMENTATION AND CONTROL DEVICES FOR HVAC**

**PART 2 PRODUCTS**

**1.01 EQUIPMENT - GENERAL**

- A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

**END OF SECTION 230913**

**SECTION 231123  
FACILITY NATURAL-GAS PIPING**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Pipe, pipe fittings, valves, and connections for natural gas piping systems.

**1.02 RELATED REQUIREMENTS**

- A. Section 099113 - Exterior Painting.
- B. Section 099123 - Interior Painting.
- C. Section 230516 - Expansion Fittings and Loops for HVAC Piping.
- D. Section 230548 - Vibration and Seismic Controls for HVAC.
- E. Section 230553 - Identification for HVAC Piping and Equipment.
- F. Section 335216 - Gas Hydrocarbon Piping.

**1.03 REFERENCE STANDARDS**

- A. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2021.
- B. ASME B31.1 - Power Piping; 2024.
- C. ASME B31.9 - Building Services Piping; 2020.
- D. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.
- E. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- F. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2023a.
- G. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2018, with Editorial Revision (2020).
- H. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry; 2018, with Editorial Revision (2020).
- I. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2017, with Editorial Revision (2020).
- J. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2023.
- K. MSS SP-78 - Gray Iron Plug Valves, Flanged and Threaded Ends; 2011.
- L. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010, with Errata .

**1.04 QUALITY ASSURANCE**

- A. Perform work in accordance with applicable codes.

- B. Valves: Manufacturer's name and pressure rating marked on valve body.

### **1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- B. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

## **PART 2 PRODUCTS**

### **2.01 NATURAL GAS PIPING, ABOVE GRADE**

- A. Steel Pipe: ASTM A53/A53M, Grade B, Type F, Schedule 40 black.
  - 1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M, wrought steel welding type.
  - 2. Joints: Threaded or welded to ASME B31.1.

### **2.02 FLANGES, UNIONS, AND COUPLINGS**

- A. Unions for Pipe Sizes 3 Inches (80 mm) and Under:
  - 1. Ferrous Pipe: Class 150 malleable iron threaded unions.
- B. Flanges for Pipe Size Over 1 Inch (25 mm):
  - 1. Ferrous Pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.

### **2.03 PIPE HANGERS AND SUPPORTS**

- A. Provide hangers and supports that comply with MSS SP-58.
  - 1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
  - 2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
  - 3. Trapeze Hangers: Welded steel channel frames attached to structure.
  - 4. Vertical Pipe Support: Steel riser clamp.
  - 5. Rooftop Supports for Low-Slope Roofs: Steel pedestals with bases that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified; and as follows:
    - a. Bases: High density polypropylene.
    - b. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
    - c. Steel Components: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.
    - d. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports; corrosion resistant material.

- e. Height: Provide minimum clearance of 6 inches (150 mm) under pipe to top of roofing.
- B. 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.
  6. Other Types: As required.

#### **2.04 BALL VALVES**

- A. Construction, 4 Inches (100 mm) and Smaller: MSS SP-110, Class 150, 400 psi (2760 kPa) CWP, brass, bronze, or ductile iron body, 304 stainless steel or chrome plated brass ball, regular port, Teflon seats and stuffing box ring, blowout proof stem, lever handle with balancing stops, solder, threaded, or grooved ends with union.

#### **2.05 PLUG VALVES**

- A. Construction 2-1/2 Inches (65 mm) and Larger: MSS SP-78, 175 psi (1200 kPa) CWP, cast iron body and plug, pressure lubricated, Teflon or Buna N packing, flanged or grooved ends. Provide lever operator with set screw.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that excavations are to required grade, dry, and not over-excavated.

#### **3.02 PREPARATION**

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

#### **3.03 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- D. Install piping to maintain headroom, conserve space, and not interfere with use of space.
- E. Group piping whenever practical at common elevations.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Refer to Section 230516.
- G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

- H. Provide access where valves and fittings are not exposed.
- I. Provide support for utility meters in accordance with requirements of utility companies.
- J. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting.
  - 1. Painting of interior piping systems and components is specified in Section 099123.
  - 2. Painting of exterior piping systems and components is specified in Section 099113.
- K. Install valves with stems upright or horizontal, not inverted.
- L. Pipe vents from gas pressure reducing valves to outdoors and terminate in weather proof hood.
- M. Sleeve pipes passing through partitions, walls and floors.
- N. Pipe Hangers and Supports:
  - 1. Install in accordance with ASME B31.9.
  - 2. Support horizontal piping as indicated.
  - 3. Install hangers to provide minimum 1/2 inch (15 mm) space between finished covering and adjacent work.
  - 4. Place hangers within 12 inches (300 mm) of each horizontal elbow.
  - 5. Use hangers with 1-1/2 inch (40 mm) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
  - 6. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
  - 7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
  - 8. Provide hangers adjacent to motor driven equipment with vibration isolation; refer to Section 230548.

### 3.04 APPLICATION

- A. Install unions downstream of valves and at equipment or apparatus connections.
- B. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- C. Install ball valves for throttling, bypass, or manual flow control services.
- D. Provide plug valves in natural gas systems for shut-off service.

### 3.05 SERVICE CONNECTIONS

- A. Provide new gas service complete with gas meter and regulators in accordance with Section 335216. Gas service distribution piping to have initial minimum pressure of 7 inch wg (1.75 kPa). Provide regulators on each line serving gravity type appliances, sized in accordance with equipment.

### 3.06 SCHEDULES

- A. Pipe Hanger Spacing:

1. Metal Piping:
  - a. Pipe Size: 1/2 inches (15 mm) to 1-1/4 inches (32 mm):
    - 1) Maximum Hanger Spacing: 6.5 ft (2 m).
    - 2) Hanger Rod Diameter: 3/8 inches (9 mm).
  - b. Pipe Size: 1-1/2 inches (40 mm) to 2 inches (50 mm):
    - 1) Maximum Hanger Spacing: 10 ft (3 m).
    - 2) Hanger Rod Diameter: 3/8 inch (9 mm).
  - c. Pipe Size: 2-1/2 inches (65 mm) to 3 inches (75 mm):
    - 1) Maximum Hanger Spacing: 10 ft (3 m).
    - 2) Hanger Rod Diameter: 1/2 inch (13 mm).
  - d. Pipe Size: 4 inches (100 mm) to 6 inches (150 mm):
    - 1) Maximum Hanger Spacing: 10 ft (3 m).
    - 2) Hanger Rod Diameter: 5/8 inch (15 mm).

**END OF SECTION 231123**

**SECTION 233100  
HVAC DUCTS AND CASINGS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Metal ducts.
- B. Flexible ducts.

**1.02 RELATED REQUIREMENTS**

- A. Section 078400 - Firestopping.
- B. Section 230713 - Duct Insulation: External insulation and duct liner.
- C. Section 233300 - Air Duct Accessories.
- D. Section 233319 - Duct Silencers.
- E. Section 233600 - Air Terminal Units.
- F. Section 233700 - Air Outlets and Inlets: Fabric air distribution devices.

**1.03 REFERENCE STANDARDS**

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- D. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2018, with Editorial Revision (2020).
- E. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry; 2018, with Editorial Revision (2020).
- F. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.
- G. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2024.
- H. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.
- I. SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual; 2012.
- J. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; Current Edition, Including All Revisions.

**1.04 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data for duct materials.
- C. Shop Drawings: Indicate duct fitting types, gauges, sizes, welds, and configuration.

- D. Test Reports: Indicate pressure tests performed. Include date, section tested, test pressure, and leakage rate per appropriate seal class, following SMACNA (LEAK).
- E. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

#### **1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience, and approved by manufacturer.
- B. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum three years of documented experience.

#### **1.06 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.

#### **1.07 WARRANTY**

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.

### **PART 2 PRODUCTS**

#### **2.01 GENERAL REQUIREMENTS**

- A. Provide UL Class 1 ductwork, fittings, hangers, supports, and appurtenances in accordance with NFPA 90A and SMACNA (DCS) guidelines unless stated otherwise.
- B. Provide metal duct unless otherwise indicated. Fibrous glass duct can be substituted at the Contractor's option.
- C. Acoustical Treatment: Provide sound-absorbing liners and sectional silencers for metal-based ducts in compliance with Section 233319.
- D. Duct Shape and Material in accordance with Allowed Static Pressure Range:
  - 1. Round: Plus or minus 2 in-wc (500 Pa) of galvanized steel.
  - 2. Rectangular: Plus or minus 1/2 in-wc (125 Pa) of galvanized steel.
- E. Duct Sealing and Leakage in accordance with Static Pressure Class:
  - 1. Duct Pressure Class and Material for Common Mechanical Ventilation Applications:
    - a. Supply Air: 1/2 in-wc (125 Pa) pressure class, galvanized steel.
    - b. Outside Air Intake: 1/2 in-wc (125 Pa) pressure class, galvanized steel.
    - c. Return and Relief Air: 1/2 in-wc (125 Pa) pressure class, galvanized steel.
    - d. General Exhaust Air: 1/2 in-wc (125 Pa) pressure class, galvanized steel.
  - 2. Low Pressure Service: Up to 2 in-wc (500 Pa):
    - a. Seal: Class C, apply to seal off transverse joints.
    - b. Leakage:

- 1) Rectangular: Class 24 or 24 cfm/100 sq ft (680 Lpm/9.3 sq m).
  - 2) Round: Class 12 or 12 cfm/100 sq ft (340 Lpm/9.3 sq m).
- F. Duct Fabrication Requirements:
1. Duct and Fitting Fabrication and Support: SMACNA (DCS) including specifics for continuously welded round and oval duct fittings.
  2. Use reinforced and sealed sheet-metal materials at recommended gauges for indicated operating pressures or pressure class.
  3. Construct tees, 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 airfoil turning vanes of perforated metal with glass fiber insulation.
  4. Provide turning vanes of perforated metal with glass fiber insulation when acoustical lining is indicated.
  5. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
  6. Provide turning vanes of perforated metal with glass fiber insulation when an acoustical lining is required.
  7. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

## 2.02 METAL DUCTS

- A. Material Requirements:
1. Galvanized Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.
- B. Round Metal Ducts:
1. Round Single Wall Duct: Round lock seam duct with galvanized steel outer wall.
    - a. Manufacturers:
      - 1) EHG, a DMI Company: [www.ehgduct.com/#sle](http://www.ehgduct.com/#sle).
      - 2) Elgen Manufacturing Company, Inc; Snap Lock Pipes and Fittings: [www.elgenmfg.com/#sle](http://www.elgenmfg.com/#sle).
      - 3) Linx Industries, Inc, a DMI Company: [www.li-hvac.com/#sle](http://www.li-hvac.com/#sle).
      - 4) Nordfab Ducting: [www.nordfab.com/#sle](http://www.nordfab.com/#sle).
      - 5) Substitutions: See Section 016000 - Product Requirements.
  2. Round Connection System: Interlocking duct connection system in accordance with SMACNA (DCS).
    - a. Manufacturers:
      - 1) Ductmate Industries, Inc, a DMI Company: [www.ductmate.com/#sle](http://www.ductmate.com/#sle).
      - 2) Nordfab Ducting: [www.nordfab.com/#sle](http://www.nordfab.com/#sle).
      - 3) Substitutions: See Section 016000 - Product Requirements.
- C. Connectors, Fittings, Sealants, and Miscellaneous:

1. Fittings: Manufacture with solid inner wall of perforated galvanized steel.
2. Transverse Duct Connection System: SMACNA "E" rated rigid class connection, interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips in accordance with SMACNA (DCS).
3. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
  - a. 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.
  - b. VOC Content: Not more than 250 g/L, excluding water.
  - c. Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested in accordance with ASTM E84.
  - d. For Use with Flexible Ducts: UL labeled.
4. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.
5. Hanger Fasteners: Attach hangers to structure using appropriate fasteners as follows:
  - a. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
  - b. Masonry Screw Type Anchors: Complying with ICC-ES AC106.
  - c. Other Types: As required.

### 2.03 FLEXIBLE DUCTS

- A. Flexible Ducts: UL 181, Class 1, polyethylene film, mechanically fastened and rolled using galvanized steel to form spiral helix.
  1. Insulation: R6 insulation with polyethylene vapor barrier film.
  2. Pressure Rating: 10 in-wc (2.50 kPa) positive and 5 in-wc (1.25 kPa) negative.
  3. Maximum Velocity: 5500 fpm (27.9 m/sec).
  4. Temperature Range: Minus 20 degrees F to 250 degrees F (Minus 28 degrees C to 121 degrees C).

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. Install, support, and seal ducts in accordance with SMACNA (DCS).
- B. Install products following the manufacturer's instructions.
- C. Comply with safety standards NFPA 90A and NFPA 90B.
- D. During construction, provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering the ductwork system.
- E. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- F. Flexible Ducts: Connect to metal ducts with adhesive.

- G. Duct sizes indicated are precise inside dimensions. For lined ducts, maintain sizes inside lining.
- H. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- I. Use crimp joints with or without bead for joining round duct sizes 8 inch (200 mm) and smaller with a crimp in the direction of airflow.
- J. Use double nuts and lock washers on threaded rod supports.
- K. At exterior wall louvers, seal duct to louver frame and install blank-out panels.
- L. Louver Fit-out:
  - 1. Provide blank-out panels sealing available area of wall-mounted exterior-faced louver when connected ductwork is smaller than actual louver free area, and duct outlet is smaller than the louver frame.
  - 2. Use the same duct material painted black on the exterior side, then seal louver frame and duct.
- M. Fire Partitions: Provide firestopping sealing. See Section 078400.
- N. Duct Accessories, Terminal Units, Inlets, and Outlets: Interconnect as indicated in Sections 233300, 233600, and 233700.
- O. Duct Insulation: Provide duct insulation. See Section 230713.

**END OF SECTION 233100**

**SECTION 233300**  
**AIR DUCT ACCESSORIES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Air turning devices/extractors.
- B. Backdraft dampers - metal.
- C. Backdraft dampers - fabric.
- D. Combination fire and smoke dampers.
- E. Combination fire and smoke dampers - corridor dampers.
- F. Duct access doors.
- G. Duct test holes.
- H. Fire dampers.
- I. Flexible duct connectors.
- J. Smoke dampers.
- K. Volume control dampers.
- L. Low leakage (Class 1A) control dampers.
- M. Miscellaneous Products:
  - 1. Damper operators.
  - 2. Fire-rated enclosures.

**1.02 REFERENCE STANDARDS**

- A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.
- B. NFPA 92 - Standard for Smoke Control Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- C. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2024.
- D. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.
- E. UL 33 - Safety Heat Responsive Links for Fire-Protection Service; Current Edition, Including All Revisions.
- F. UL 555 - Standard for Fire Dampers; Current Edition, Including All Revisions.
- G. UL 555C - Standard for Safety Ceiling Dampers; Current Edition, Including All Revisions.
- H. UL 555S - Standard for Smoke Dampers; Current Edition, Including All Revisions.

**1.03 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide for shop-fabricated assemblies including volume control dampers, duct access doors, duct test holes, and hardware used. Include electrical characteristics and connection requirements.
- C. Shop Drawings: Indicate for shop fabricated assemblies including volume control dampers.
- D. Manufacturer's Installation Instructions: Provide instructions for fire dampers.
- E. Project Record Drawings: Record actual locations of access doors and test holes.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 016000 - Product Requirements for additional provisions.
  - 2. Extra Fusible Links: One of each type and size.

**1.04 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.
- B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Protect dampers from damage to operating linkages and blades.

**PART 2 PRODUCTS****2.01 AIR TURNING DEVICES/EXTRACTORS**

- A. Manufacturers:
  - 1. Carlisle HVAC Products; Dynair Hollow Vane and Rail (Double Wall Vane): [www.carlislehvac.com/#sle](http://www.carlislehvac.com/#sle).
  - 2. Elgen Manufacturing Company, Inc: [www.elgenmfg.com/#sle](http://www.elgenmfg.com/#sle).
  - 3. Krueger-HVAC, Division of Air System Components: [www.krueger-hvac.com/#sle](http://www.krueger-hvac.com/#sle).
  - 4. Ruskin Company: [www.ruskin.com/#sle](http://www.ruskin.com/#sle).
  - 5. Titus HVAC, a brand of Johnson Controls: [www.titus-hvac.com/#sle](http://www.titus-hvac.com/#sle).
  - 6. Substitutions: See Section 016000 - Product Requirements.
- B. Multi-blade device with blades aligned in short dimension; steel construction; with individually adjustable blades, mounting straps.

**2.02 BACKDRAFT DAMPERS - METAL**

- A. Manufacturers:
  - 1. Louvers & Dampers, Inc, a brand of Mestek, Inc: [www.louvers-dampers.com/#sle](http://www.louvers-dampers.com/#sle).

2. Nailor Industries, Inc: [www.nailor.com/#sle](http://www.nailor.com/#sle).
  3. Pottorff: [www.pottorff.com/#sle](http://www.pottorff.com/#sle).
  4. Ruskin Company: [www.ruskin.com/#sle](http://www.ruskin.com/#sle).
  5. United Enertech: [www.unitedenertech.com/#sle](http://www.unitedenertech.com/#sle).
  6. Substitutions: See Section 016000 - Product Requirements.
- B. Gravity Backdraft Dampers, Size 18 by 18 inches (450 by 450 mm) or Smaller, Furnished with Air Moving Equipment: Air moving equipment manufacturer's standard construction.
- C. 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.

### **2.03 BACKDRAFT DAMPERS - FABRIC**

- A. Fabric Backdraft Dampers: Factory-fabricated.
1. Blades: Neoprene coated fabric material.
  2. Birdscreen: 1/2 inch (12 mm) nominal mesh of galvanized steel or aluminum.
  3. Maximum Velocity: 1000 fpm (5 mps) face velocity.

### **2.04 COMBINATION FIRE AND SMOKE DAMPERS**

- A. Manufacturers:
1. AireTechnologies, Inc, a DMI Company: [www.airetechnologies.com/#sle](http://www.airetechnologies.com/#sle).
  2. Lloyd Industries, Inc: [www.firedamper.com/#sle](http://www.firedamper.com/#sle).
  3. Louvers & Dampers, Inc, a brand of Mestek, Inc: [www.louvers-dampers.com/#sle](http://www.louvers-dampers.com/#sle).
  4. Nailor Industries, Inc: [www.nailor.com/#sle](http://www.nailor.com/#sle).
  5. NCA, a brand of Metal Industries Inc: [www.ncamfg.com/#sle](http://www.ncamfg.com/#sle).
  6. Pottorff: [www.pottorff.com/#sle](http://www.pottorff.com/#sle).
  7. Ruskin Company: [www.ruskin.com/#sle](http://www.ruskin.com/#sle).
  8. United Enertech: [www.unitedenertech.com/#sle](http://www.unitedenertech.com/#sle).
  9. Substitutions: See Section 016000 - Product Requirements.
- B. Fabricate in accordance with NFPA 90A, UL 555, UL 555S, and as indicated.
- C. Provide factory sleeve and collar for each damper.
- D. Multiple Blade Dampers: Fabricate with 16 gauge, 0.0598 inch (1.52 mm) galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, stainless steel jamb seals, 1/8 by 1/2 inch (3.2 by 12.7 mm) plated steel concealed linkage, stainless steel closure spring, blade stops, and lock, and 1/2 inch (12.7 mm) actuator shaft.

- E. Operators: UL listed and labeled; spring-return, electric-type suitable for 120 volts, single phase, 60 Hz. Provide end switches to indicate damper position. Locate damper operator on interior of duct and link to damper operating shaft.
- F. Normally Open Smoke Responsive Fire Dampers: Curtain type, closing upon actuation of electro thermal link, flexible stainless steel blade edge seals to provide constant sealing pressure, stainless steel springs with locking devices to ensure positive closure for units mounted horizontally.
- G. Electro Thermal Link: Fusible link melting at 165 degrees F (74 degrees C); 120 volts, single phase, 60 Hz; UL listed and labeled.

## 2.05 COMBINATION FIRE AND SMOKE DAMPERS - CORRIDOR DAMPERS

- A. Manufacturers:
  - 1. Ruskin Company: [www.ruskin.com/#sle](http://www.ruskin.com/#sle).
  - 2. United Enertech: [www.unitedenertech.com/#sle](http://www.unitedenertech.com/#sle).
  - 3. Substitutions: See Section 016000 - Product Requirements.
- B. Fabricate in accordance with NFPA 90A, UL 555, UL 555S, and as indicated.
- C. Provide factory sleeve and collar for each damper.
- D. Multiple Blade Dampers: Fabricate with 16 gauge, 0.0598 inch (1.52 mm) galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, stainless steel jamb seals, 1/8 by 1/2 inch (3.2 by 12.7 mm) plated steel concealed linkage, stainless steel closure spring, blade stops, and lock, and 1/2 inch (12.7 mm) actuator shaft.
- E. Operators: UL listed and labeled; spring-return, electric type suitable for 120 volts, single phase, 60 Hz. Provide end switches to indicate damper position. Locate damper operator on interior of duct and link to damper operating shaft.
- F. Normally Open Smoke Responsive Fire Dampers: Curtain type, closing upon actuation of electro thermal link, flexible stainless steel blade edge seals to provide constant sealing pressure, stainless steel springs with locking devices to ensure positive closure for units mounted horizontally.
- G. Electro Thermal Link: Fusible link melting at 165 degrees F (74 degrees C); 120 volts, single phase, 60 Hz; UL listed and labeled.

## 2.06 DUCT ACCESS DOORS

- A. Manufacturers:
  - 1. Acudor Products Inc, a Division of Nelson Industrial Inc: [www.acudor.com/#sle](http://www.acudor.com/#sle).
  - 2. Ductmate Industries, Inc, a DMI Company: [www.ductmate.com/#sle](http://www.ductmate.com/#sle).
  - 3. Elgen Manufacturing Company, Inc: [www.elgenmfg.com/#sle](http://www.elgenmfg.com/#sle).
  - 4. Lloyd Industries, Inc: [www.firedamper.com/#sle](http://www.firedamper.com/#sle).
  - 5. Nailor Industries, Inc: [www.nailor.com/#sle](http://www.nailor.com/#sle).
  - 6. Ruskin Company: [www.ruskin.com/#sle](http://www.ruskin.com/#sle).
  - 7. SEMCO LLC: [www.semcohvac.com/#sle](http://www.semcohvac.com/#sle).

8. The Williams Brothers Corporation of America: [www.wbdoors.com/#sle](http://www.wbdoors.com/#sle).
  9. Substitutions: See Section 016000 - Product Requirements.
- B. Fabricate in accordance with SMACNA (DCS) and as indicated.
- C. Access doors with sheet metal screw fasteners are not acceptable.

## 2.07 DUCT TEST HOLES

- A. Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.
1. Manufacturers:
    - a. Carlisle HVAC Products; Dynair Test Port with Red Cap with O-Ring Seal: [www.carlislehvac.com/#sle](http://www.carlislehvac.com/#sle).
    - b. Substitutions: See Section 016000 - Product Requirements.

## 2.08 FIRE DAMPERS

- A. Manufacturers:
1. AireTechnologies, Inc, a DMI Company: [www.airetechnologies.com/#sle](http://www.airetechnologies.com/#sle).
  2. Lloyd Industries, Inc: [www.firedamper.com/#sle](http://www.firedamper.com/#sle).
  3. Louvers & Dampers, Inc, a brand of Mestek, Inc: [www.louvers-dampers.com/#sle](http://www.louvers-dampers.com/#sle).
  4. Nailor Industries, Inc: [www.nailor.com/#sle](http://www.nailor.com/#sle).
  5. NCA, a brand of Metal Industries Inc: [www.ncamfg.com/#sle](http://www.ncamfg.com/#sle).
  6. Panasonic Corporation of North America; Flex Damper: [www.panasonic.com/#sle](http://www.panasonic.com/#sle).
  7. Pottorff: [www.pottorff.com/#sle](http://www.pottorff.com/#sle).
  8. Ruskin Company: [www.ruskin.com/#sle](http://www.ruskin.com/#sle).
  9. United Enertech: [www.unitedenertech.com/#sle](http://www.unitedenertech.com/#sle).
  10. Substitutions: See Section 016000 - Product Requirements.
- B. Fabricate in accordance with NFPA 90A and UL 555, and as indicated.
- C. Ceiling (Radiation) Dampers: Galvanized steel, 22-gauge, 0.0299-inch (0.76 mm) frame and 16-gauge, 0.0598-inch (1.52 mm) flap, two layers of 0.125-inch (3.2 mm) thick ceramic fiber on top side and one layer on bottom side for round flaps, with locking clip.
1. Boot Fitting: Factory-provided el type (90 degree). Include field-provided collar.
  2. Box Fitting: Factory-provided 26 gauge, 0.0179 inch (0.45 mm) with field-provided collar.
  3. Rated for three hour service in compliance with UL 555C.
- D. Horizontal Dampers: Galvanized steel, 22-gauge, 0.0299-inch (0.76 mm) frame, stainless steel closure spring, and lightweight, heat-retardant, non-asbestos fabric blanket.
- E. Curtain Type Dampers: Galvanized steel with interlocking blades. Provide stainless steel closure springs and latches for horizontal installations. Configure with blades out

of air stream except for 1-inch (250 Pa) pressure-class ducts up to 12 inches (300 mm) in height.

- F. Multiple Blade Dampers: 16-gauge, 0.0598-inch (1.52 mm) galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, 1/8 by 1/2 inch (3.2 by 12.7 mm) plated steel concealed linkage, stainless steel closure spring, blade stops, and lock.
- G. Fusible Links: UL 33, separate at 160 degrees F (71 degrees C) with adjustable link straps for combination fire/balancing dampers.

## 2.09 FLEXIBLE DUCT CONNECTORS

- A. Manufacturers:
  - 1. Carlisle HVAC Products; Dynair Connector Plus G90 Steel Offset Seam Neoprene Fabric: [www.carlislehvac.com/#sle](http://www.carlislehvac.com/#sle).
  - 2. Ductmate Industries, Inc, a DMI Company: [www.ductmate.com/#sle](http://www.ductmate.com/#sle).
  - 3. Elgen Manufacturing Company, Inc: [www.elgenmfg.com/#sle](http://www.elgenmfg.com/#sle).
  - 4. Substitutions: See Section 016000 - Product Requirements.
- B. Fabricate in accordance with SMACNA (DCS) and as indicated.
- C. Flexible Duct Connections: Fabric crimped into metal edging strip.

## 2.10 SMOKE DAMPERS

- A. Fabricate in accordance with NFPA 90A and UL 555S, and as indicated.
- B. Dampers: UL Class 1 airfoil blade type smoke damper, normally open automatically operated by pneumatic actuator.
- C. Electro Thermal Link: Fusible link melting at 165 degrees F (74 degrees C); 120 volts, single phase, 60 Hz; UL listed and labeled.

## 2.11 VOLUME CONTROL DAMPERS

- A. Manufacturers:
  - 1. AireTechnologies, Inc, a DMI Company: [www.airetechnologies.com/#sle](http://www.airetechnologies.com/#sle).
  - 2. Nailor Industries, Inc: [www.nailor.com/#sle](http://www.nailor.com/#sle).
  - 3. Ruskin Company: [www.ruskin.com/#sle](http://www.ruskin.com/#sle).
  - 4. United Enertech: [www.unitedenertech.com/#sle](http://www.unitedenertech.com/#sle).
  - 5. Substitutions: See Section 016000 - Product Requirements.
- B. Splitter Dampers:

## 2.12 LOW LEAKAGE (CLASS 1A) CONTROL DAMPERS

- A. Manufacturers:
  - 1. Ruskin Company; CD50: [www.ruskin.com/#sle](http://www.ruskin.com/#sle).
  - 2. United Enertech: [www.unitedenertech.com/#sle](http://www.unitedenertech.com/#sle).
  - 3. Substitutions: See Section 016000 - Product Requirements.
- B. Maximum Leakage Allowed: 3 cfm/sq ft at 1 in-wc (15.2 L/sec/sq m at 0.25 kPa).
- C. Frame:

1. Material: 20-gauge galvanized steel.
  2. Free-area: Single cross section.
- D. Blade:
1. Type: Single-blade rectangle shape.
  2. Operation: Opposed type.
  3. Maximum Individual Blade Height: 8 inches (203 mm).
  4. Material: 12-gauge galvanized steel.
- E. Other Requirements:
1. Rust Inhibitor Coating: Moisture and salt water-resistant.
  2. Sleeve or Flange: Factory-mounted standard.
  3. Custom: Include bird screen and insect screen.

### 2.13 MISCELLANEOUS PRODUCTS

- A. Damper Operators: Provide electric operators; see Section 253513.
- B. Damper position switch; see Section 253516.
- C. Fire-Rated Enclosures:
  1. Provide as required to preserve fire resistance rating of building elements.

## PART 3 EXECUTION

### 3.01 PREPARATION

- A. Verify that electric power is available and of the correct characteristics.

### 3.02 INSTALLATION

- A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). See Section 233100 for duct construction and pressure class.
- B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.
- C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide for cleaning kitchen exhaust ducts in accordance with NFPA 96 Provide minimum 8 by 8 inch (200 by 200 mm) size access door for hand and shoulder access, or as indicated on drawings. Provide minimum 4 by 4 inch (100 by 100 mm) size access door for balancing dampers only. Review locations prior to fabrication.
- D. Provide duct test holes where indicated and required for testing and balancing purposes.
- E. Provide fire dampers, combination fire and smoke dampers, and smoke dampers at locations indicated, where ducts and outlets pass through fire-rated components, and where required by authorities having jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.

- F. Install smoke dampers and combination smoke and fire dampers in accordance with NFPA 92.
- G. Demonstrate re-setting of fire dampers to Owner's representative.
- H. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.
- I. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.
- J. 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 two duct widths from duct take-off.
- K. Use splitter dampers only where indicated.
- L. 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 233300**

**SECTION 233416  
CENTRIFUGAL HVAC FANS**

**PART 1 GENERAL****1.01 REFERENCE STANDARDS**

- A. AMCA (DIR) - (Directory of) Products Licensed Under AMCA International Certified Ratings Program; 2015.
- B. AMCA 99 - Standards Handbook; 2016.
- C. AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating; 2016, with Errata (2018).

**1.02 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on centrifugal fans and accessories including fan curves with specified operating point plotted, power, rpm, sound power levels for both fan inlet and outlet at rated capacity, and electrical characteristics and connection requirements.
- C. Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

**1.03 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.
- B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

**1.04 DELIVERY, STORAGE, AND HANDLING**

- A. Protect motors, shafts, and bearings from weather and construction dust.

**1.05 FIELD CONDITIONS**

- A. Permanent fans may not be used for ventilation during construction.

**PART 2 PRODUCTS****2.01 MANUFACTURERS**

- A. Greenheck: [www.greenheck.com/#sle](http://www.greenheck.com/#sle).
- B. Carnes, a division of Carnes Company Inc: [www.carnes.com/#sle](http://www.carnes.com/#sle).
- C. Substitutions: See Section 016000 - Product Requirements.

**2.02 PERFORMANCE REQUIREMENTS**

- A. Performance Ratings: Determined in accordance with AMCA 210 and bearing the AMCA Certified Rating Seal.
- B. Fabrication: Comply with AMCA 99.

**2.03 WHEEL AND INLET**

**2.04 BEARINGS AND DRIVES**

**PART 3 EXECUTION**

**3.01 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Provide backdraft dampers on exhaust fans located at discharge side; see Section 233300.

**END OF SECTION 233416**

**SECTION 233700**  
**AIR OUTLETS AND INLETS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Registers/grilles:
  - 1. Ceiling-mounted, exhaust and return register/grilles.
  - 2. Ceiling-mounted, supply register/grilles.
  - 3. Wall-mounted, supply register/grilles.
  - 4. Wall-mounted, exhaust and return register/grilles.
- B. Duct-mounted supply and return registers/louvers.

**1.02 REFERENCE STANDARDS**

- A. ASHRAE Std 70 - Method of Testing the Performance of Air Outlets and Air Inlets; 2023.
- B. ASHRAE Std 130 - Laboratory Methods of Testing Air Terminal Units; 2016.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- D. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.
- E. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2024.
- F. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.
- G. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.
- H. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.
- I. UL 2518 - Standard for Safety Air Dispersion Systems; Current Edition, Including All Revisions.

**1.03 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.
- C. Fabric Duct:
  - 1. Provide detailed drawings confirming configuration of Textile Dispersion System (diameter, lengths, airflow, pressure, and textile permeability).
  - 2. Provide detailed installation instructions for components to be installed.
  - 3. Provide warranty and maintenance documentation.

**1.04 QUALITY ASSURANCE**

- A. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum 6 years of documented experience.

**PART 2 PRODUCTS****2.01 MANUFACTURERS**

- A. Carnes, a division of Carnes Company Inc: [www.carnes.com/#sle](http://www.carnes.com/#sle).
- B. Krueger-HVAC: [www.krueger-hvac.com/#sle](http://www.krueger-hvac.com/#sle).
- C. Metalaire, a brand of Metal Industries Inc: [www.metalaire.com/#sle](http://www.metalaire.com/#sle).
- D. Price Industries: [www.priceindustries.com/#sle](http://www.priceindustries.com/#sle).
- E. Ruskin Company: [www.ruskin.com/#sle](http://www.ruskin.com/#sle).
- F. Titus, a brand of Air Distribution Technologies; \_\_\_\_\_: [www.titus-hvac.com/#sle](http://www.titus-hvac.com/#sle).
- G. Tuttle and Bailey: [www.tuttleandbailey.com/#sle](http://www.tuttleandbailey.com/#sle).
- H. Substitutions: See Section 016000 - Product Requirements.

**PART 3 EXECUTION****3.01 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 comply 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 diffuser, or grille and register assembly.
- F. Paint ductwork visible behind air outlets and inlets matte black, see Section 099123.

**3.02 INSTALLATION OF TEXTILE AIR DISPERSION SYSTEM:**

- A. Install chosen suspension system in accordance with the requirements of the manufacturer. Instructions for installation shall be provided by the manufacturer with product.
- B. CLEANING AND PROTECTION:
  - 1. Clean air handling unit and ductwork prior to the DuctSox system unit-by-unit as it is installed. Clean external surfaces of foreign substance which may cause corrosive deterioration of facing.

2. Temporary Closure: At ends of ducts which are not connected to equipment or distribution devices at time of ductwork installation, cover with polyethylene film or other covering which will keep the system clean until installation is completed.
3. If DuctSox systems become soiled during installation, they should be removed and cleaned following the manufacturers standard terms of laundry.

### **3.03 CLOSEOUT ACTIVITIES**

- A. Demonstrate operational system to Owner's representative.
- B. Instruct Owner's representative to maintain system and use occupant controls or interfaces, as required.

### **3.04 PROTECTION**

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

**END OF SECTION 233700**

**SECTION 237416**  
**PACKAGED ROOFTOP AIR-CONDITIONING UNITS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Packaged, small-capacity, rooftop air-conditioning units.

**1.02 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide capacity and dimensions of manufactured products and assemblies required for this project. Indicate electrical service with electrical characteristics and connection requirements, and duct connections.
- C. Manufacturer's Instructions: Indicate assembly, support details, connection requirements, and include start-up instructions.
- D. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

**1.03 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.
- B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

**1.04 DELIVERY, STORAGE, AND HANDLING**

- A. Protect units from physical damage by storing off site until roof mounting curbs are in place and ready for immediate installation of units.

**1.05 WARRANTY**

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Provide a five year warranty to include coverage for refrigeration compressors.

**PART 2 PRODUCTS**

**2.01 PACKAGED, SMALL-CAPACITY, ROOFTOP AIR-CONDITIONING UNITS**

- A. General: Roof mounted units having gas burner and electric refrigeration that are 6 tons and smaller in capacity.
- B. Description: Self-contained, packaged, factory assembled and prewired, consisting of cabinet and frame, supply fan, return fan, heat exchanger and burner, heat recovery coil, controls, air filters, refrigerant cooling coil and compressor, condenser coil and condenser fan.
- C. Refrigerant: Use only refrigerants that have ozone depletion potential (ODP) of zero and global warming potential (GWP) no greater than that allowed by federal code.

**2.02 CASING**

- A. Cabinet: Steel with baked enamel finish, including access panels with screwdriver-operated flush, cam type fasteners. Structural members to be minimum 18 gauge, 0.0478 inch (1.21 mm), with access doors or panels of minimum 20 gauge, 0.0359 inch (0.91 mm).

**2.03 BURNERS**

- A. Gas Burner: Atmospheric type burner with adjustable combustion air supply, pressure regulator, gas valves, manual shut-off, intermittent spark or glow coil ignition, flame-sensing device, and automatic 100 percent shutoff pilot.
- B. Gas Burner Safety Controls: Energize ignition, limit time for establishment of flame, prevent opening of gas valve until pilot flame is proven, stop gas flow on ignition failure, energize blower motor, and after airflow proven and slight delay, allow gas valve to open.

**2.04 EVAPORATOR COIL**

- A. Provide copper tube aluminum fin coil assembly with galvanized drain pan and connection.
- B. Provide capillary tubes or thermostatic expansion valves for units of 6 tons (21 kw) capacity and less, and thermostatic expansion valves and alternate row circuiting for units 7.5 tons (26 kw) cooling capacity and larger.

**2.05 COMPRESSORS**

- A. Provide hermetic compressors, 3600 rpm maximum, resiliently mounted with positive lubrication, crankcase heater, high and low pressure safety controls, motor overload protection, suction and discharge service valves and gauge ports, and filter drier.

**2.06 AIR FILTERS:**

- A. 1-inch (25 mm) thick, permanent washable.

**2.07 ROOF CURBS**

- A. Roof Mounting Curb: 24 inches (610 mm) high, galvanized steel, channel frame with gaskets, nailer strips.

**PART 3 EXECUTION****3.01 EXAMINATION**

- A. Verify that roof is ready to receive work and opening dimensions are as required by manufacturer.
- B. Verify that proper power supply is available.

**3.02 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Mount units on factory built roof mounting curb providing watertight enclosure to protect ductwork and utility services. Install roof mounting curb level.

**3.03 SYSTEM STARTUP**

- A. Prepare and start equipment. Adjust for proper operation.

**END OF SECTION 237416**

**SECTION 238113**  
**PACKAGED TERMINAL AIR-CONDITIONERS**

**PART 1 GENERAL****1.01 REFERENCE STANDARDS**

- A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.

**1.02 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data for manufactured products and assemblies. Indicate water, drain, thermostatic valves, and electrical rough-in connections with electrical characteristics and connection requirements.
- C. Manufacturer's Instructions: Indicate assembly, support details, connection requirements, and include start-up instructions.
- D. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 016000 - Product Requirements, for additional provisions.
  - 2. Extra Filters: One set for each unit.

**1.03 QUALITY ASSURANCE**

- A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

**1.04 WARRANTY**

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Provide a five year warranty to include coverage for refrigeration compressors.

**PART 2 PRODUCTS****2.01 MANUFACTURERS**

- A. Ephoca; Ephoca.com.

**PART 3 EXECUTION****3.01 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with requirements of NFPA 90A.

**END OF SECTION 238113**

**SECTION 238126.13**  
**SMALL-CAPACITY SPLIT-SYSTEM AIR CONDITIONERS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Air cooled condensing units.
- B. Controls.

**1.02 RELATED REQUIREMENTS**

- A. Section 260583 - Wiring Connections: Electrical characteristics and wiring connections and installation and wiring of thermostats and other controls components.

**1.03 REFERENCE STANDARDS**

- A. AHRI 210/240 - Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2023.
- B. ASHRAE Std 23 - Methods for Performance Testing Positive Displacement Refrigerant Compressors and Compressor Units; 2022.
- C. UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical; Current Edition, Including All Revisions.

**1.04 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.

**PART 2 PRODUCTS****2.01 SYSTEM DESIGN**

- A. Split-System Heating and Cooling Units: Self-contained, packaged, matched factory-engineered and assembled, pre-wired indoor and outdoor units; UL listed.
  - 1. Provide refrigerant lines internal to units and between indoor and outdoor units, factory cleaned, dried, pressurized and sealed, with insulated suction line.
- B. Performance Requirements: See Drawings for additional requirements.
- C. Electrical Characteristics:
  - 1. Disconnect Switch: Factory mount disconnect switch on equipment under provisions of Section 260583.

**2.02 OUTDOOR UNITS**

- A. Outdoor Units: Self-contained, packaged, pre-wired unit consisting of cabinet, with compressor and condenser.
  - 1. Construction and Ratings: In accordance with AHRI 210/240 with testing in accordance with ASHRAE Std 23 and UL 207.
- B. Accessories: Filter drier, high-pressure switch (manual reset), low pressure switch (automatic reset), service valves and gauge ports, thermometer well (in liquid line).

1. Provide thermostatic expansion valves.

C. Operating Controls:

1. Control by room thermostat to maintain room temperature setting.

**END OF SECTION 238126.13**

**SECTION 238143****AIR-SOURCE UNITARY HEAT PUMP WITH INTEGRATED ENERGY RECOVERY  
AIR-SOURCE UNITARY HEAT PUMP WITH INTERGRATED ENERGY RECOVERY (ERV)****PART 1 - GENERAL****2.01 SECTION INCLUDES**

- A. Air Source Unitary Heat Pump with integrated Energy Recovery Ventilator (ERV)
  - 1. Vertical Stack Unit
  - 2. Wall Mounted Unit
- B. Controls
  - 1. TFT wall mounted
  - 2. Basic wall mounted
  - 3. Third-party thermostats

**RELATED SECTIONS**

- A. Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, and SAMPLES.
- B. Section 23 05 11, COMMON WORK RESULTS FOR HVAC: General mechanical requirements and items, which are common to more than one section of Division 23
- C. Section 23 31 00, HVAC DUCTS AND CASINGS: Requirements for sheet metal ductwork.
- D. Section 23 05 93, TESTING, ADJUSTING, AND BALANCING FOR HVAC: Requirements for testing, adjusting and balancing of HVAC system.
- E. Section 23 09 23, DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC: Requirements for controls and instrumentation.

**SUBMITTALS**

- A. Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.
  - 1. Product Data: Include rated capacities, weights, furnished specialties, and accessories for each model indicated.
  - 2. Shop Drawings: Detail layout and installation of wall penetrations.
  - 3. Wiring Diagrams: Detail wiring for power, signal, and control systems and differentiate between manufacturer-installed and field-installed wiring.
  - 4. Warranties: Full one-year warranty plus full ten-year warranty on compressor and limited second through tenth-year warranty as per warranty documentation.

**QUALITY ASSURANCE**

- A. The HVAC and ERV system shall be manufactured in facilities registered to follow the International Standard Organization (ISO) ISO 9001 - Quality
- B. Comply with ASHRAE Standard 15, Safety Code for Mechanical Refrigeration.

- C. Comply with ASHRAE Standard 90.1, Energy Standard for Buildings except for Low-Rise Residential Buildings for cooling and heating performance requirements when tested in accordance with AHRI //210/240//AHRI 390// and UL 1995.
- D. Comply with Fed Spec A-A-50502//Type I, having factory assembled refrigerant circuit or circuits (Packaged Unit), Class 1, "Department of Energy" (DOE) covered products (units with cooling capacity up to 65000 Btu/hr).

#### **PROJECT CONDITIONS**

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by the manufacturer for optimum results. Do not install products under environmental conditions outside the manufacturer's recommended limits.

#### **SEQUENCING**

- A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

#### **COORDINATION**

- A. Coordinate layout and installation of units and wall construction where the unit penetrates the wall or is supported by it.

#### **DELIVERY, STORAGE, AND HANDLING**

- A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly indicating manufacturer and material.
- B. Storage: Store materials in a dry area indoors, protected from damage and in accordance with manufacturer's instructions.
- C. Handling: Handle in accordance with the manufacturer's instructions. Protect materials and finishes during handling and installation to prevent damage.

#### **WARRANTY**

- A. Full One-Year Warranty: For the period of one year from the date of certification by a factory-certified technician, the Manufacturer shall replace any part of the unit which fails due to a defect in materials or workmanship. During this full one-year warranty, the Manufacturer shall provide, on-site, free of charge, all labor and related service costs to replace the defective part. If located in an area where the Manufacturer does not have a certified technician, the Manufacturer shall ship a replacement unit and arrange to pick up the defective unit at the Manufacturer's cost.
- B. Full Ten-Year Warranty on Compressor: For the period of ten years from the date of certification by a factory-certified technician, the Manufacturer shall replace the compressor should it fail due to a defect in materials or workmanship. During this full ten-year warranty, the Manufacturer shall provide, on-site, free of charge, all labor and related service costs to replace the defective compressor. If located in an area where the Manufacturer does not have a certified technician, the Manufacturer shall ship a replacement unit and arrange to pick up the defective unit at the Manufacturer's cost.

- C. Limited Second through Tenth Year Warranty: For the period of the second through the tenth year after certification by a factory-certified technician, the Manufacturer shall replace any part(s) should they fail due to a defect in materials or workmanship. During this additional nine-year limited warranty, the Owner will be responsible for any labor and related service costs.

## PRODUCTS

### APPROVED MANUFACTURERS

- A. Ephoca, Inc. 2000 Auburn Drive, Beachwood, OH 44122 Phone 216-710-1000 Website ephoca.com
- B. Innova, SRL Via 1° Maggio, 8 38089 STORO (TN) - ITALY Phone +39 0465-670104 website innovaenergie.com

### VERTICAL STACK UNIT

- A. Description:
1. Unitary self-contained Unitary self-contained heat pump with integrated ERV unit with cabinet and controls; fully charged with refrigerant.
  2. The unit shall be a concealed ducted indoor unit that mounts within a mechanical closet with a return and a front or vertical discharge supply.
  3. Contained within the heat pump portion of the unit shall be a twin rotary, inverter-driven compressor, refrigerant system, all factory wiring, piping, electronic modulating Electronic Expansion Valve (EEV), heated condensate pan, control circuit board, an outdoor fan with EC motor, and 2 indoor fans with independent EC motors.
  4. Contained within the unit for the Energy Recovery Ventilator (ERV) portion of the unit shall be a high performing Counterflow Enthalpy Exchanger, fans with EC motors, one for intake, one for exhaust, and MERV13 filters on the intake and exhaust.
  5. The unit shall only require a single 6" external intake for both the heat pump and the outside air for the ERV.
  6. The unit shall only require a single 6" external exhaust for both the heat pump and the outside air for the ERV.
  7. The unit shall be capable of providing static pressure up to 0.60 inch (15.24 mm).WG for indoor ducting up to 0.70 inch (17.78 mm). WG for outdoor ducting.
  8. The unit shall be less than 12 inch (304.8 mm). in deep and shall require an installation space of less than 12 in. deep.
  9. The unit shall have an Auto-restart function that allows the unit to resume operation after power interruption.
- B. Outdoor Temperatures:
1. The unit shall be capable of operating in heating mode down to 5°F ambient temperature and cooling mode down to 60°F ambient temperature.
- C. Compressor:

1. The unit shall be equipped with an inverter-driven twin rotary compressor.
  2. The compressor shall be equipped with automatic thermal overload protection.
  3. The compressor modulating capacity shall be between 35% and 110%.
- D. Refrigerant:
1. The unit shall be available in R32.
- E. Condenser fan:
1. The fan motor shall be variable speed EC.
  2. The fans shall be capable of providing a static pressure up to 0.70 inch (17.78 mm).WG. for external ducting.
  3. The fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.
  4. The fan motor shall be electrically protected.
  5. The fan shall be protected with a metal grille
  6. The fan blowing shall provide horizontal discharge.
- F. ERV exhaust fan:
1. The fan motor shall be variable speed EC.
  2. The fan speed shall be field adjustable to control the amount of fresh air.
  3. The fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.
  4. The fan motor shall be electrically protected.
  5. The exhaust fan can be connected to a bathroom duct to provide exhaust instead of a bathroom fan.
- G. ERV supply fan:
1. The fan motor shall be variable speed EC.
  2. The fan speed shall be field adjustable to control the amount of fresh air.
  3. The fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.
  4. The fan motor shall be electrically protected.
  5. The fresh air is mixed into the supply air.
- H. Indoor supply fans:
1. There shall be two independent fans.
  2. Each fan shall have its own variable speed EC motor.
  3. The fans shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.
  4. The fans shall be capable of providing a static pressure up to 0.60 inch (15.24 mm).WG. for internal ducting.
  5. The fans shall offer three (3) speeds, Low, Mid, and High.
  6. The fans shall have a selectable Auto fan setting that will adjust the fan speed based on the difference between the controller set-point and space temperature.

7. The unit shall offer the capability of preventing the fan from operating when the temperature is satisfied in heating mode.
- I. Condenser Coil:
    1. The condenser coil shall be of nonferrous construction with lanced or corrugated plate fins on copper tubing.
    2. The coil fins shall have a factory-applied corrosion-resistant finish.
    3. The coils shall be pressure tested at the factory.
  - J. Indoor Coil:
    1. The indoor coil shall be of nonferrous construction with lanced or corrugated plate fins on copper tubing.
    2. The coils shall be pressure tested at the factory.
  - K. Counterflow Enthalpy Exchanger
    1. Manufactured with a hygienic, mold and bacteria resistant, water washable polymer membrane.
    2. High efficiency with unique and patented channel design.
  - L. Filter:
    1. Return air shall be filtered by means of a MERV3 washable air filter.
    2. The filter shall be on the sides of the unit.
    3. The filter construction shall include a Fungicide agent.
  - M. Drainage:
    1. The unit shall be equipped with an integral insulated drain pan.
    2. The drain pan shall have a heating element.
    3. Provide connection to piped condensate drain system to a code-approved location.
  - N. Condensate Evaporator System:
    1. A condensate drain is not required for cooling, as condensate is evaporated.
    2. The unit shall contain a condensate evaporator system comprised of a pump and misting nozzles.
    3. The pump shall pump the condensate above the height of the condenser coil where the mister nozzles shall drizzle the condensate to the coil where it is evaporated.
  - O. Electrical:
    1. The unit shall be available to be powered by 208-230V/single-phase, 60 Hz. and shall be able to operate satisfactorily within the 187 to 251 Voltage range.
    2. The unit shall be available to be powered by 115V/single-phase, 60 Hz. and shall be able to operate satisfactorily within the 98 to 120 Voltage range.
    3. Indoor unit electric circuits shall be electronically protected using fuses.
    4. The unit shall be available with an LCDI power cord in the appropriate voltage.
  - P. Electric-Resistance Heating Coil:

1. The electric-resistance heating element shall work in tandem with the heat pump, when the heat pumps output is insufficient to heat the room.
2. The unit shall be available with 900-watt supplemental electric-resistance heating element with a contactor and high-temperature-limit switch.
3. The unit shall be available with 1,800-watt supplemental electric-resistance heating element with a contactor and high-temperature-limit switch.

Q. Control and Communication

1. The unit shall be controlled by integral microprocessors.
2. The unit includes an integrated onboard controller
3. The unit includes an integrated WiFi controller
4. The unit shall be able to work with additional optional controllers which can be added to the unit with a gateway board.
  - a. Third-party gateway which enables any third-party thermostat to control the unit
  - b. Wall-mounted basic touch controller for easy to access controls while mounted on the wall.
  - c. Wall-mounted advanced TFT touchscreen controller with comprehensive seven-day scheduling.
  - d. BACnet interface.

R. Cabinet:

- a. The cabinet shall be fabricated of 18-gauge galvanized steel
- b. The cabinet shall be finished in RAL 9003.
- c. The cabinet shall be capable of connecting to a return air duct or grille from the sides of the unit.
- d. The cabinet shall be capable of connecting to a supply air duct or grille to the front or top of unit.
- e. The cabinet shall have removable access panels.

## REQUIRED ACCESSORIES

A. Wall sleeves

1. From the unit to the exterior louvers

B. Exterior louvers

1. Exterior louvers are required for supply and exhaust air.
2. Louvers must meet the required free area and pressure drop as specified by the manufacturer.

C. Interior grilles and diffusers

1. Interior grilles and diffusers are required for supply and return air.
2. Grilles and diffusers must meet the required free area and pressure drop as specified by the manufacturer.

**ONBOARD TOUCH CONTROLLER**

- A. The unit includes an integrated onboard controller that shall be capable of displaying settings and values, controlling the unit and programming parameters.
- B. The unit includes an integrated onboard controller with the following features:
  - 1. Touch Sensor Capacitive buttons.
  - 2. Dimmable backlit display with night mode.
  - 3. Modes: Auto, Cool, Heat, Dry, Fan.
  - 4. Automatic Change over (Heat/Cool) with a dead band.
  - 5. Temperature set point adjustment
  - 6. Restricted temperature ranges for heating and cooling
  - 7. Fan speed control includes: low, med, high and auto.
  - 8. Temperature settings in Fahrenheit and Celsius.
  - 9. Sleep mode.
  - 10. Keypad lock.
  - 11. Displays error codes

**WIFI CONTROLLER**

- 1. The unit includes an integrated WiFi interface that can be accessed by an available Android or iOS app.
- 2. The WiFi app interface shall be capable of viewing and controlling multiple units.
- 3. The interface shall be equipped with a local WiFi host for local use of the app. (scheduling requires an internet connection)
- 4. The interface shall be equipped with a TCP/IP network communication for over the Internet connection.
- 5. Languages: English
- 6. The app shall offer the following features:
  - a. Temperature settings in Fahrenheit and Celsius.
  - b. Temperature setpoint adjustment.
  - c. Modes: Auto, Cool, Heat, Dry, Fan.
  - d. Automatic Change over (Heat/Cool) with a dead band.
  - e. Fan speed control includes: low, med, high and auto.
  - f. Louver control (for models with louvers).
  - g. Schedule: Weekly or Daily multiple schedules and temperature setpoints each day.
  - h. Schedules can be applied to units or their groups.
  - i. Registering of units.
  - j. Supports multiple users for each unit.
  - k. Display room temperature.
  - l. Show error messages.

**WALL MOUNTED TFT TOUCHSCREEN CONTROLLER**

- A. The controller shall be capable of displaying settings and values and controlling the unit.
- B. The controller shall have a full-color 4.3" TFT touchscreen 480 x 272 pixels resolution.
- C. The controller shall measure 3.12" x 4.76"
- D. The controller shall mount inside a standard single gang junction box.
- E. The controller shall connect and be powered by a gateway board installed into the unit.
- F. The gateway board must be installed into the unit by a qualified electrician or HVAC technician and takes approximately 20 minutes to install.
- G. The connection between the controller and the gateway board shall be 4 conductor, 18 AWG, shielded communication cable up to a length of 40 feet (1219.2 cm)
- H. The controller shall offer the following features:
  - 1. Temperature settings in Fahrenheit and Celsius.
  - 2. Temperature setpoint adjustment.
  - 3. Modes: Auto, Cool, Heat, Dry, Fan.
  - 4. Automatic Change over (Heat/Cool) with a dead band.
  - 5. Fan speed control includes: low, med, high and auto.
  - 6. Louver control (for models with louvers).
  - 7. Schedule: Weekly or Daily multiple schedules and temperature setpoints each day.
  - 8. Vacation mode.

**WALL MOUNTED BASIC CONTROLLER**

- A. The controller shall be capable of displaying settings and values and controlling the unit.
- B. The controller shall have touch sensitive buttons with backlit text and icons.
- C. The controllers backlit LED display shall dim after 15 second of inactivity.
- D. The controller shall measure 3.41" x 3.35".
- E. The controller shall be surface mounted to the wall.
- F. The controller shall connect and be powered by a gateway board installed into the unit.
- G. The gateway board must be installed into the unit by a qualified electrician or HVAC technician and takes approximately 20 minutes to install.
- H. The connection between the controller and the gateway board shall be 4 conductor, 18 AWG, shielded communication cable up to a length of 40 feet (1219.2 cm)
- I. The controller shall offer the following features:
  - 1. Temperature settings in Fahrenheit and Celsius.

2. Temperature setpoint adjustment.
3. Modes: Auto, Cool, Heat, Dry, Fan.
4. Automatic Change over (Heat/Cool) with a dead band.
5. Fan speed control includes: low, med, high and auto.
6. Louver control (for models with louvers).
7. Keypad lock.

#### **HANDHELD WIRESS CONTROLLER**

- A. The Wireless Remote shall be capable of controlling the unit. This remote shall be designed to be hand-held.
- B. It shall use an infrared signal to communicate to the unit.
- C. It shall measure 2.8" x 6".
- D. The remote shall be equipped with buttons to facilitate its settings.
- E. The remote shall be powered by a single CR2012 3V Dry Lithium Battery.
- F. The remote shall offer the following features:
  1. Modes: Auto, Cool, Heat, Dry, Fan.
  2. Temperature setpoint adjustment.
  3. Fan speed control includes: low, med, high and auto.
  4. Louver control (for models with louvers).

#### **THIRD PARTY GATEWAY**

- A. The gateway enables the connection of any standard or smart thermostat to the unit.
- B. Includes ability to control the following from the third-party thermostat:
  1. Power: On and Off
  2. Mode: Cool, heat, dehumidify.
  3. Fan speed: Low, med and high (if the thermostat is so equipped).
- C. A gateway board that must be installed into the unit by a qualified electrician or HVAC technician and takes approximately 20 minutes to install.
- D. When using the connected third-party thermostat, the thermostat will override the onboard controller on the unit and WiFi app will not work.
- E. Connections to third-party thermostat thermostats include: R, C, Y, W, G1, G2, G3 and a 24V power supply.

#### **PART EXECUTION**

##### **21.01 EXAMINATION**

- A. Do not begin installation until wall openings have been properly prepared.
- B. If preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

**PREPARATION**

- A. Prepare conditions using the methods recommended by the manufacturer for achieving the best result for the operation under the project conditions.

**INSTALLATION**

- A. Coordinate installation of vent sleeves in finished wall assembly; seal and weatherproof.
  - 1. Caulking per Section 07 90 00 - Joint Protection.
  - 2. Flashing per Section 07 60 00 - Flashing and Sheet Metal.
- B. Coordinate installation of louvers that are in compliance with manufacturers' specifications for pressure drop and free area.
- C. Install in accordance with manufacturer's instructions, approved submittals and in proper relationship with adjacent construction including the following.
  - 1. Ductwork connections.
  - 2. Drain connection to drainage system.
  - 3. Electrical connections per NFPA 70.
- D. Clearance Tolerances per Manufacturer's Written Instructions:
  - 1. Clearance at the exterior of the unit for unobstructed airflow around the vents.
  - 2. Clearance at the interior of the unit for unobstructed airflow around the vents.
  - 3. Clearance at the interior of the unit for maintenance purposes.
  - 4. Minimum vertical and horizontal clearance between unit and walls.
- E. Install units according to the manufacturer's written instructions.
- F. Connect units to wiring systems and to ground as indicated and instructed by the manufacturer. All electrical work shall comply with Division 26 Sections.
- G. Ductwork: Comply with requirements in Section 23 31 00, HVAC DUCTS AND CASINGS.

**CLEANING**

- A. After completing system installation, including outlet fittings and devices, inspect the exposed finish. Remove dirt, and construction debris.
- B. Wipe cabinet and controller clean.

**COMMISSIONING**

- A. All commissioning activities shall be completed by the manufacturer's factory authorized personnel. The manufacturer's factory authorized personnel agent shall be an employee of the system manufacturer or an employee of the manufacturer's representative.
- B. Completion of the commissioning process shall verify that the system has been installed per the Engineer's design intent and complies with the manufacturer's engineering and installation specifications related to the used equipment.

- C. Compliance with federal, state and local codes as well as other authorities having jurisdictions are not part of this process and are the responsibility of the installing contractor.
- D. Unit is 100% level on the vertical and horizontal axis.
- E. Unit is securely fastened to supporting materials.
- F. Unit cabinet has no visible damage.
- G. Condenser coils and fans have no visible damage.
- H. Interior vents, supply and return are not blocked by any furniture, plants or window coverings.
- I. External vent holes are 100% aligned internally with the unit's vents holes.
- J. Exterior vents are not blocked by walls or plantings.
- K. Exterior grilles are installed correctly.
- L. Exterior grilles are properly sealed.
- M. Controls are connected and operable, cycle unit through fan speeds and heat/cool operation.
- N. Return air and outdoor vent air filters are installed and clean.
- O. The condensate drain is functioning properly.

#### **INSTRUCTIONS**

- A. Provide instruction to personnel in the operation and maintenance of the unit.

#### **PROTECTION**

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

**END OF SECTION 238143**

**SECTION 260505  
SELECTIVE DEMOLITION FOR ELECTRICAL**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Electrical demolition.

**PART 2 PRODUCTS**

**2.01 MATERIALS AND EQUIPMENT**

- A. Materials and equipment for patching and extending work: As specified in individual sections.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verify that abandoned wiring and equipment serve only abandoned facilities.
- B. Demolition drawings are based on casual field observation and no record documents.
- C. Beginning of demolition means installer accepts existing conditions.

**3.02 PREPARATION**

- A. Disconnect electrical systems in walls, floors, and ceilings to be removed.

**3.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK**

- A. Remove existing installations to accommodate new construction.
- B. Remove abandoned wiring to source of supply.
- C. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
- D. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets that are not removed.
- E. Disconnect and remove abandoned panelboards and distribution equipment.
- F. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.
- G. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.
- H. Repair adjacent construction and finishes damaged during demolition and extension work.
- I. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.

**3.04 CLEANING AND REPAIR**

- A. Clean and repair existing materials and equipment that remain or that are to be reused.

**END OF SECTION**

**SECTION 260513**  
**MEDIUM-VOLTAGE CABLES**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Medium voltage cable.
- B. Cable accessories.

**1.02 RELATED REQUIREMENTS**

- A. Section 260553 - Identification for Electrical Systems.

**1.03 REFERENCE STANDARDS**

- A. IEEE 48 - IEEE Standard for Test Procedures and Requirements for Alternating-Current Cable Terminations Used on Shielded Cables Having Laminated Insulation Rated 2.5 kV through 765 kV or Extruded Insulation Rated 2.5 kV through 500 kV; 2020.
- B. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; 2021.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

**1.04 SUBMITTALS**

- A. Product Data: Provide for cable, terminations, and accessories.

**1.05 QUALITY ASSURANCE**

- A. Comply with NFPA 70.
- B. Installer Qualifications: Authorized installer of specified manufacturer with service facilities within 100 miles (160 km) of Project.
- C. Products: Listed, classified, and labeled as suitable for the purpose intended.

**PART 2 PRODUCTS****2.01 MEDIUM-VOLTAGE CABLE**

- A. Manufacturers:
  - 1. General Cable Technologies Corporation: [www.generalcable.com/#sle](http://www.generalcable.com/#sle).
  - 2. Okonite: [www.okonite.com/#sle](http://www.okonite.com/#sle).
  - 3. Southwire Company: [www.southwire.com/#sle](http://www.southwire.com/#sle).
- B. Medium Voltage Cable: NEMA WC 70 rubber insulated cable.
  - 1. Voltage: 5 kV, grounded.
  - 2. Conductor: Copper, compact round, stranded, with foil conductor shield.
  - 3. Construction: Single conductor with metal wire insulation shielding.

**2.02 CABLE ACCESSORIES**

- A. Manufacturers:

1. 3M: [www.3m.com/#sle](http://www.3m.com/#sle).
  2. TE Connectivity; Raychem Products: [www.te.com/#sle](http://www.te.com/#sle).
- B. Potheads: IEEE 48, Class 1 termination. Pothead with porcelain insulators, cable connector and aerial lug, sealed cable entrance and support, and insulating compound.
- C. Cable Terminations: IEEE 48, Class 2 porcelain insulator cable terminator in kit form.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that conduit are ready to receive cable.
- B. Cable routing is shown in approximate locations unless dimensioned. Route as required to complete wiring system.

#### **3.02 PREPARATION**

- A. Use swab to clean conduits before pulling cables.

#### **3.03 INSTALLATION**

- A. Avoid abrasion and other damage to cables during installation.
- B. Use suitable lubricants and pulling equipment.
- C. Sustain cable pulling tensions and bending radii below recommended limits.
- D. Ground cable shield at each termination and splice.

#### **3.04 FIELD QUALITY CONTROL**

- A. Inspect exposed cable sections for physical damage.
- B. Inspect cable for proper connections as indicated.
- C. Inspect shield grounding, cable supports, and terminations for proper installation.

#### **3.05 PROTECTION**

- A. Protect installed cables from entrance of moisture.

**END OF SECTION**

**SECTION 260519****LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Single conductor building wire.
- B. Underground feeder and branch-circuit cable.
- C. Service entrance cable.
- D. Metal-clad cable.
- E. Wiring connectors.
- F. Electrical tape.
- G. Heat shrink tubing.
- H. Oxide inhibiting compound.
- I. Wire pulling lubricant.
- J. Cable ties.
- K. Firestop sleeves.

**1.02 RELATED REQUIREMENTS**

- A. Section 078400 - Firestopping.
- B. Section 260505 - Selective Demolition for Electrical: Disconnection, removal, and/or extension of existing electrical conductors and cables.
- C. Section 260513 - Medium-Voltage Cables: Cables and terminations for systems 601 V through 35,000 V.
- D. Section 260526 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.
- E. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- F. Section 284600 - Fire Detection and Alarm: Fire alarm system conductors and cables.

**1.03 REFERENCE STANDARDS**

- A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013 (Reapproved 2018).
- B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2023.
- C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010, with Editorial Revision (2020).
- D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2020).

- E. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2017.
- F. ASTM D4388 - Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes; 2020.
- G. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- H. NECA 120 - Standard for Installing Armored Cable (AC) and Type Metal-Clad (MC) Cable; 2018.
- I. NECA 121 - Standard for Installing Nonmetallic-Sheathed Cable (Type NM-B) and Underground Feeder and Branch-Circuit Cable (Type UF); 2007.
- J. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; 2021.
- K. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.
- L. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- M. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.
- N. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.
- O. UL 267 - Outline of Investigation for Wire-Pulling Compounds; Current Edition, Including All Revisions.
- P. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.
- Q. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.
- R. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.
- S. UL 493 - Thermoplastic-Insulated Underground Feeder and Branch-Circuit Cables; Current Edition, Including All Revisions.
- T. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.
- U. UL 854 - Service-Entrance Cables; Current Edition, Including All Revisions.
- V. UL 1569 - Metal-Clad Cables; Current Edition, Including All Revisions.

#### **1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
  - 2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.

3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

#### **1.05 SUBMITTALS**

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.

#### **1.06 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

#### **1.08 FIELD CONDITIONS**

- A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F (-10 degrees C), unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Architect and obtain direction before proceeding with work.

### **PART 2 PRODUCTS**

#### **2.01 CONDUCTOR AND CABLE APPLICATIONS**

- A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.
- B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.
- C. Nonmetallic-sheathed cable is not permitted.

#### **2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS**

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.
- D. Comply with NEMA WC 70.
- E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.
- F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.
- G. Conductor Material:
  1. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.

2. Tinned Copper Conductors: Comply with ASTM B33.

#### H. Minimum Conductor Size:

1. Branch Circuits: 12 AWG.
  - a. Exceptions:
    - 1) 20 A, 120 V circuits longer than 75 feet (23 m): 10 AWG, for voltage drop.
    - 2) 20 A, 120 V circuits longer than 150 feet (46 m): 8 AWG, for voltage drop.
2. Control Circuits: as required by manufacturer instructions..

#### I. Conductor Color Coding:

1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
2. Color Coding Method: Integrally colored insulation.
3. Color Code:
  - a. 208Y/120 V, 3 Phase, 4 Wire System:
    - 1) Phase A: Black.
    - 2) Phase B: Red.
    - 3) Phase C: Blue.
    - 4) Neutral/Grounded: White.
  - b. Equipment Ground, All Systems: Green.
  - c. Travelers for 3-Way and 4-Way Switching: Pink.
  - d. For control circuits, comply with manufacturer's recommended color code.

### 2.03 SINGLE CONDUCTOR BUILDING WIRE

#### A. Manufacturers:

1. Copper Building Wire:
  - a. Cerro Wire LLC: [www.cerrowire.com/#sle](http://www.cerrowire.com/#sle).
  - b. Encore Wire Corporation: [www.encorewire.com/#sle](http://www.encorewire.com/#sle).
  - c. General Cable Technologies Corporation: [www.generalcable.com/#sle](http://www.generalcable.com/#sle).
  - d. Service Wire Co: [www.servicewire.com/#sle](http://www.servicewire.com/#sle).
  - e. Southwire Company: [www.southwire.com/#sle](http://www.southwire.com/#sle).

#### B. Description: Single conductor insulated wire.

#### C. Conductor Stranding:

1. Feeders and Branch Circuits:
  - a. Size 10 AWG and Smaller: Solid.
  - b. Size 8 AWG and Larger: Stranded.

#### D. Insulation Voltage Rating: 600 V.

#### E. Insulation:

1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.

- a. Size 4 AWG and Larger: Type XHHW-2.
- b. Installed Underground: Type XHHW-2.
- c. Fixture Wiring Within Luminaires: Type TFFN/TFN for luminaires with labeled maximum temperature of 90 degrees C; Approved suitable type for luminaires with labeled maximum temperature greater than 90 degrees C.

#### **2.04 UNDERGROUND FEEDER AND BRANCH-CIRCUIT CABLE**

- A. Manufacturers:
  1. Cerro Wire LLC: [www.cerrowire.com/#sle](http://www.cerrowire.com/#sle).
  2. Encore Wire Corporation: [www.encorewire.com/#sle](http://www.encorewire.com/#sle).
  3. Service Wire Co: [www.servicewire.com/#sle](http://www.servicewire.com/#sle).
  4. Southwire Company: [www.southwire.com/#sle](http://www.southwire.com/#sle).
- B. Description: NFPA 70, Type UF multiple-conductor cable listed and labeled as complying with UL 493, Type UF-B.
- C. Provide equipment grounding conductor unless otherwise indicated.
- D. Conductor Stranding:
  1. Size 10 AWG and Smaller: Solid.
  2. Size 8 AWG and Larger: Stranded.
- E. Insulation Voltage Rating: 600 V.

#### **2.05 SERVICE ENTRANCE CABLE**

- A. Manufacturers:
  1. Copper Service Entrance Cable:
    - a. Cerro Wire LLC: [www.cerrowire.com/#sle](http://www.cerrowire.com/#sle).
    - b. Encore Wire Corporation: [www.encorewire.com/#sle](http://www.encorewire.com/#sle).
    - c. Service Wire Co: [www.servicewire.com/#sle](http://www.servicewire.com/#sle).
    - d. Southwire Company: [www.southwire.com/#sle](http://www.southwire.com/#sle).
- B. Service Entrance Cable for Underground Use: NFPA 70, Type USE single-conductor cable listed and labeled as complying with UL 854, Type USE-2, and with UL 44 Type RHH/RHW-2.
- C. Conductor Stranding: Stranded.
- D. Insulation Voltage Rating: 600 V.

#### **2.06 METAL-CLAD CABLE**

- A. Manufacturers:
  1. AFC Cable Systems Inc: [www.afcweb.com/#sle](http://www.afcweb.com/#sle).
  2. Encore Wire Corporation: [www.encorewire.com/#sle](http://www.encorewire.com/#sle).
  3. Service Wire Co: [www.servicewire.com/#sle](http://www.servicewire.com/#sle).
  4. Southwire Company: [www.southwire.com/#sle](http://www.southwire.com/#sle).
- B. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.

- C. Conductor Stranding:
  - 1. Size 10 AWG and Smaller: Solid.
  - 2. Size 8 AWG and Larger: Stranded.
- D. Insulation Voltage Rating: 600 V.
- E. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.
- F. Grounding: Full-size integral equipment grounding conductor.
- G. Armor: Steel, interlocked tape.

## 2.07 WIRING CONNECTORS

- A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.
- B. Connectors for Grounding and Bonding: Comply with Section 260526.
- C. Wiring Connectors for Splices and Taps:
  - 1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
  - 2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.
- D. Wiring Connectors for Terminations:
  - 1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
  - 2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.
  - 3. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.
  - 4. Conductors for Control Circuits: Use crimped terminals for all connections.
- E. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F (105 degrees C) for standard applications and 302 degrees F (150 degrees C) for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.
  - 1. Manufacturers:
    - a. 3M: [www.3m.com/#sle](http://www.3m.com/#sle).
    - b. Ideal Industries, Inc: [www.idealindustries.com/#sle](http://www.idealindustries.com/#sle).
    - c. NSI Industries LLC: [www.nsiindustries.com/#sle](http://www.nsiindustries.com/#sle).
- F. Push-in Wire Connectors: Rated 600 V, 221 degrees F (105 degrees C).
  - 1. Manufacturers:
    - a. Ideal Industries, Inc: [www.idealindustries.com/#sle](http://www.idealindustries.com/#sle).
    - b. NSI Industries LLC: [www.nsiindustries.com/#sle](http://www.nsiindustries.com/#sle).
    - c. Wago Corporation: [www.wago.us/#sle](http://www.wago.us/#sle).
- G. Mechanical Connectors: Provide bolted type or set-screw type.

1. Manufacturers:
  - a. Burndy LLC: [www.burndy.com/#sle](http://www.burndy.com/#sle).
  - b. nVent ILSCO: [www.ilSCO.com/#sle](http://www.ilSCO.com/#sle).
  - c. Thomas & Betts Corporation: [www.tnb.com/#sle](http://www.tnb.com/#sle).
- H. Compression Connectors: Provide circumferential type or hex type crimp configuration.
  1. Manufacturers:
    - a. Burndy LLC: [www.burndy.com/#sle](http://www.burndy.com/#sle).
    - b. nVent ILSCO: [www.ilSCO.com/#sle](http://www.ilSCO.com/#sle).
    - c. Thomas & Betts Corporation: [www.tnb.com/#sle](http://www.tnb.com/#sle).
- I. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.
  1. Manufacturers:
    - a. Burndy LLC: [www.burndy.com/#sle](http://www.burndy.com/#sle).
    - b. IlSCO: [www.ilSCO.com/#sle](http://www.ilSCO.com/#sle).
    - c. Thomas & Betts Corporation: [www.tnb.com/#sle](http://www.tnb.com/#sle).

## 2.08 ACCESSORIES

- A. Electrical Tape:
  1. Manufacturers:
    - a. 3M: [www.3m.com/#sle](http://www.3m.com/#sle).
    - b. Plymouth Rubber Europa: [www.plymouthrubber.com/#sle](http://www.plymouthrubber.com/#sle).
  2. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
  3. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F (-18 degrees C) and suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
  4. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil (0.76 mm); suitable for continuous temperature environment up to 194 degrees F (90 degrees C) and short-term 266 degrees F (130 degrees C) overload service.
  5. Electrical Filler Tape: Rubber-based insulating moldable putty, minimum thickness of 125 mil (3.2 mm); suitable for continuous temperature environment up to 176 degrees F (80 degrees C).
  6. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, all-weather vinyl backing; minimum thickness of 90 mil (2.3 mm).
- B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.

1. Manufacturers:
  - a. 3M: [www.3m.com/#sle](http://www.3m.com/#sle).
  - b. Burndy LLC: [www.burndy.com/#sle](http://www.burndy.com/#sle).
  - c. Thomas & Betts Corporation: [www.tnb.com/#sle](http://www.tnb.com/#sle).
- C. Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.
  1. Manufacturers:
    - a. Burndy LLC: [www.burndy.com/#sle](http://www.burndy.com/#sle).
    - b. Ideal Industries, Inc: [www.idealindustries.com/#sle](http://www.idealindustries.com/#sle).
    - c. IlSCO: [www.ilSCO.com/#sle](http://www.ilSCO.com/#sle).
- D. Wire Pulling Lubricant:
  1. Manufacturers:
    - a. 3M: [www.3m.com/#sle](http://www.3m.com/#sle).
    - b. American Polywater Corporation: [www.polywater.com/#sle](http://www.polywater.com/#sle).
    - c. Ideal Industries, Inc: [www.idealindustries.com/#sle](http://www.idealindustries.com/#sle).
  2. Listed and labeled as complying with UL 267.
  3. Suitable for use with conductors/cables and associated insulation/jackets to be installed.
  4. Suitable for use at installation temperature.
  5. Products:
    - a. American Polywater Corporation; Polywater J Cable Pulling Lubricant: [www.polywater.com/#sle](http://www.polywater.com/#sle).
- E. Cable Ties: Material and tensile strength rating suitable for application.
  1. Manufacturers:
    - a. Burndy LLC: [www.burndy.com/#sle](http://www.burndy.com/#sle).
- F. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for cables and roofing system to be installed; designed to accommodate existing penetrations where applicable.
  1. Products:
    - a. Menzies Metal Products; Electrical Roof Stack and Cap: [www.menzies-metal.com/#sle](http://www.menzies-metal.com/#sle).
- G. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.
  1. Products:
    - a. HoldRite, a brand of Reliance Worldwide Corporation; HydroFlame Pro Series/HydroFlame Custom Built: [www.holdrite.com/#sle](http://www.holdrite.com/#sle).

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that interior of building has been protected from weather.

- B. Verify that work likely to damage wire and cable has been completed.
- C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.
- D. Verify that field measurements are as indicated.
- E. Verify that conditions are satisfactory for installation prior to starting work.

### 3.02 PREPARATION

- A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

### 3.03 INSTALLATION

- A. Circuiting Requirements:
  - 1. Unless dimensioned, circuit routing indicated is diagrammatic.
  - 2. When circuit destination is indicated without specific routing, determine exact routing required.
  - 3. Arrange circuiting to minimize splices.
  - 4. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
  - 5. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three single phase branch circuits of different phases installed in the same raceway is permitted where not otherwise prohibited, except for the following:
    - a. Branch circuits fed from ground fault circuit interrupter (GFCI) circuit breakers.
    - b. Branch circuits fed from feed-through protection of GFI receptacles.
    - c. Branch circuits with dimming controls.
- B. Install products in accordance with manufacturer's instructions.
- C. Perform work in accordance with NECA 1 (general workmanship).
- D. Install underground feeder and branch-circuit cable (Type UF-B) in accordance with NECA 121.
- E. Install metal-clad cable (Type MC) in accordance with NECA 120.
- F. Installation in Raceway:
  - 1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
  - 2. Pull all conductors and cables together into raceway at same time.
  - 3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
  - 4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.
- G. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.

- H. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
- I. Terminate cables using suitable fittings.
  - 1. Metal-Clad Cable (Type MC):
    - a. Use listed fittings.
    - b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.
- J. Install conductors with a minimum of 12 inches (300 mm) of slack at each outlet.
- K. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.
- L. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.
- M. Make wiring connections using specified wiring connectors.
  - 1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
  - 2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
  - 3. Do not remove conductor strands to facilitate insertion into connector.
  - 4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
  - 5. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
  - 6. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- N. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
  - 1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
    - a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.
  - 2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
    - a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.

- b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.
- 3. Wet Locations: Use heat shrink tubing.
  - O. Insulate ends of spare conductors using vinyl insulating electrical tape.
  - P. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.
  - Q. Identify conductors and cables in accordance with Section 260553.
  - R. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.
  - S. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

#### **3.04 FIELD QUALITY CONTROL**

- A. Inspect and test in accordance with NETA ATS, except Section 4.
- B. Correct deficiencies and replace damaged or defective conductors and cables.

**END OF SECTION**

**SECTION 260526**  
**GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS**

**PART 2 PRODUCTS**

**1.01 GROUNDING AND BONDING REQUIREMENTS**

- A. Do not use products for applications other than as permitted by NFPA 70 and product listing.
- B. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.
- C. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

**1.02 GROUNDING AND BONDING COMPONENTS**

- A. General Requirements:
  - 1. Provide products listed, classified, and labeled as suitable for the purpose intended.
  - 2. Provide products listed and labeled as complying with UL 467 where applicable.
- B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 260526:
  - 1. Use insulated copper conductors unless otherwise indicated.
    - a. Exceptions:
      - 1) Use bare copper conductors where installed underground in direct contact with earth.
      - 2) Use bare copper conductors where directly encased in concrete (not in raceway).
- C. Connectors for Grounding and Bonding:
  - 1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
  - 2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
  - 3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.

**END OF SECTION**

**SECTION 260529**  
**HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

**1.02 RELATED REQUIREMENTS**

- A. Section 260533.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.
- B. Section 260533.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.
- C. Section 265100 - Interior Lighting: Additional support and attachment requirements for interior luminaires.

**1.03 REFERENCE STANDARDS**

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.
- D. MFMA-4 - Metal Framing Standards Publication; 2004.
- E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate sizes and arrangement of supports and bases with actual equipment and components to be installed.
  - 2. Coordinate work to provide additional framing and materials required for installation.
  - 3. Coordinate compatibility of support and attachment components with mounting surfaces at installed locations.
  - 4. Coordinate arrangement of supports with ductwork, piping, equipment and other potential conflicts.
  - 5. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

## 1.05 SUBMITTALS

- A. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.

## 1.06 QUALITY ASSURANCE

- A. Product Listing Organization Qualifications: Organization recognized by OSHA as Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

## 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

## PART 2 PRODUCTS

### 2.01 SUPPORT AND ATTACHMENT COMPONENTS

- A. General Requirements:
  - 1. Comply with the following. Where requirements differ, comply with most stringent.
    - a. NFPA 70.
    - b. Requirements of authorities having jurisdiction.
  - 2. Provide required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for complete installation of electrical work.
  - 3. Provide products listed, classified, and labeled as suitable for purpose intended, where applicable.
  - 4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for load to be supported with minimum safety factor of 1.3. Include consideration for vibration, equipment operation, and shock loads where applicable.
  - 5. Do not use products for applications other than as permitted by NFPA 70 and product listing.
  - 6. Steel Components: Use corrosion-resistant materials suitable for environment where installed.
    - a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
    - b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Conduit and Cable Supports: Straps and clamps suitable for conduit or cable to be supported.
  - 1. Manufacturers:
    - a. ABB: [www.electrification.us.abb.com/#sle](http://www.electrification.us.abb.com/#sle).
    - b. Eaton Corporation: [www.eaton.com/#sle](http://www.eaton.com/#sle).
    - c. Emerson Electric Co; O-Z/Gedney: [www.emerson.com/#sle](http://www.emerson.com/#sle).
    - d. HoldRite, a brand of Reliance Worldwide Corporation: [www.holdrite.com/#sle](http://www.holdrite.com/#sle).

2. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
3. Conduit Clamps: Bolted type unless otherwise indicated.
4. Products:
  - a. Gripple, Inc; Universal Bracket: [www.gripple.com/#sle](http://www.gripple.com/#sle).
  - b. Gripple, Inc; Fast Trak: [www.gripple.com/#sle](http://www.gripple.com/#sle).
  - c. Gripple, Inc; Universal Clamp (Threaded): [www.gripple.com/#sle](http://www.gripple.com/#sle).
  - d. Gripple, Inc; Low Profile Bracket Kits: [www.gripple.com/#sle](http://www.gripple.com/#sle).
- C. Outlet Box Supports: Hangers and brackets suitable for boxes to be supported.
  1. Manufacturers:
    - a. ABB: [www.electrification.us.abb.com/#sle](http://www.electrification.us.abb.com/#sle).
    - b. Eaton Corporation: [www.eaton.com/#sle](http://www.eaton.com/#sle).
    - c. Emerson Electric Co; O-Z/Gedney: [www.emerson.com/#sle](http://www.emerson.com/#sle).
    - d. HoldRite, a brand of Reliance Worldwide Corporation:  
[www.holdrite.com/#sle](http://www.holdrite.com/#sle).
- D. Metal Channel/Strut Framing Systems:
  1. Manufacturers:
    - a. ABB: [www.electrification.us.abb.com/#sle](http://www.electrification.us.abb.com/#sle).
    - b. Atkore International Inc; Unistrut: [www.unistrut.us/#sle](http://www.unistrut.us/#sle).
    - c. Eaton Corporation: [www.eaton.com/#sle](http://www.eaton.com/#sle).
  2. Description: Factory-fabricated, continuous-slot, metal channel/strut and associated fittings, accessories, and hardware required for field assembly of supports.
  3. Comply with MFMA-4.
  4. Channel Material:
    - a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
  5. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch (2.66 mm).
  6. Minimum Channel Dimensions: 1-5/8 inch (41 mm) wide by 13/16 inch (21 mm) high.
- E. 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. Single Conduit up to 1-inch (27 mm) Trade Size: 1/4-inch (6 mm) diameter.
    - c. Single Conduit Larger than 1-inch (27 mm) Trade Size: 3/8-inch (10 mm) diameter.
    - d. Trapeze Support for Multiple Conduits: 3/8-inch (10 mm) diameter.
    - e. Outlet Boxes: 1/4-inch (6 mm) diameter.
    - f. Luminaires: 1/4-inch (6 mm) diameter.
- F. Anchors and Fasteners:
  1. Manufacturers - Mechanical Anchors:

- a. Dewart: [anchors.dewart.com/#sle](http://anchors.dewart.com/#sle).
  - b. Hilti, Inc: [www.hilti.com/#sle](http://www.hilti.com/#sle).
  - c. ITW Red Head, a division of Illinois Tool Works, Inc:  
[www.itwredhead.com/#sle](http://www.itwredhead.com/#sle).
  - d. Simpson Strong-Tie Company Inc: [www.strongtie.com/#sle](http://www.strongtie.com/#sle).
2. Manufacturers - Powder-Actuated Fastening Systems:
    - a. Dewart: [anchors.dewart.com/#sle](http://anchors.dewart.com/#sle).
    - b. Hilti, Inc: [www.hilti.com/#sle](http://www.hilti.com/#sle).
    - c. ITW Ramset, a division of Illinois Tool Works, Inc: [www.ramset.com/#sle](http://www.ramset.com/#sle).
    - d. Simpson Strong-Tie Company Inc: [www.strongtie.com/#sle](http://www.strongtie.com/#sle).
  3. Unless otherwise indicated and where not otherwise restricted, use anchor and fastener types indicated for specified applications.
  4. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
  5. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
  6. Hollow Masonry: Use toggle bolts.
  7. Hollow Stud Walls: Use toggle bolts.
  8. Steel: Use beam clamps, machine bolts, or welded threaded studs.
  9. Sheet Metal: Use sheet metal screws.
  10. Wood: Use wood screws.
  11. Preset Concrete Inserts: Continuous metal channel/strut and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
    - a. Manufacturer: Same as manufacturer of metal channel/strut framing system.
    - b. Comply with MFMA-4.
    - c. Channel Material: Use galvanized steel.

## **PART 3 EXECUTION**

### **3.01 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.

### **3.02 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Install hangers and supports in accordance with NECA 1.
- C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
- E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

- F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- G. Equipment Support and Attachment:
  - 1. Use metal, fabricated supports 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.
- H. Conduit Support and Attachment: See Section 260533.13 for additional requirements.
- I. Box Support and Attachment: See Section 260533.16 for additional requirements.
- J. Interior Luminaire Support and Attachment: See Section 265100 for additional requirements.
- K. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.
- L. Secure fasteners in accordance with manufacturer's recommended torque settings.
- M. Remove temporary supports.

### **3.03 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**

**SECTION 260533.13**  
**CONDUIT FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Galvanized steel rigid metal conduit (RMC).
- B. Galvanized steel intermediate metal conduit (IMC).
- C. Galvanized steel electrical metallic tubing (EMT).
- D. Rigid polyvinyl chloride (PVC) conduit.
- E. Liquidtight flexible nonmetallic conduit (LFNC).
- F. High-density polyethylene (HDPE) conduit.

**1.02 RELATED REQUIREMENTS**

- A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Cable assemblies consisting of conductors protected by integral metal armor.
- B. Section 260526 - Grounding and Bonding for Electrical Systems.
- C. Section 260529 - Hangers and Supports for Electrical Systems.
- D. Section 260533.16 - Boxes for Electrical Systems.
- E. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

**1.03 REFERENCE STANDARDS**

- A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2020.
- B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S); 2020.
- C. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit; 2018.
- D. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
- E. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2020.
- F. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2021.
- G. NEMA TC 14 (SERIES) - Reinforced Thermosetting Resin Conduit and Fittings Series; 2015.
- H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.

- J. UL 6A - Electrical Rigid Metal Conduit-Aluminum, Red Brass, and Stainless Steel; Current Edition, Including All Revisions.
- K. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.
- L. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.
- M. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.
- N. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.

#### **1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate minimum sizes of conduits with actual type and quantity of conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
  - 2. Coordinate arrangement of conduits with structural members, ductwork, piping, equipment, and other potential conflicts.
  - 3. Verify exact conduit termination locations required for boxes, enclosures, and equipment.
  - 4. Coordinate work to provide roof penetrations that preserve integrity of roofing system and do not void roof warranty.
  - 5. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
  - 1. Do not begin installation of conductors and cables until installation of conduit between termination points is complete.

#### **1.05 SUBMITTALS**

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.

#### **1.06 QUALITY ASSURANCE**

- A. Product Listing Organization Qualifications: Organization recognized by OSHA as Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

## **PART 2 PRODUCTS**

### **2.01 CONDUIT APPLICATIONS**

- A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70, manufacturer's instructions, and product listing.
- B. Unless otherwise indicated and where not otherwise restricted, use conduit types indicated for specified applications. Where more than one listed application applies, comply with most restrictive requirements. Where conduit type for particular application is not specified, use galvanized steel rigid metal conduit.
- C. Underground:
  - 1. Where rigid polyvinyl chloride (PVC) conduit is provided, transition to galvanized steel rigid metal conduit (RMC) or schedule 80 rigid PVC conduit where emerging from underground.
  - 2. Where rigid polyvinyl (PVC) conduit larger than 2-inch (53 mm) trade size is provided, use galvanized steel rigid metal conduit (RMC) elbows for bends.
  - 3. Where galvanized steel rigid metal conduit (RMC) or galvanized steel intermediate metal conduit (IMC) is installed in direct contact with earth, use corrosion protection tape acceptable to authorities having jurisdiction to provide supplementary corrosion protection.
- D. Embedded Within Concrete:
  - 1. Within Slab on Grade: Use galvanized steel rigid metal conduit (RMC), rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC). Embed within structural slabs only where approved by Structural Engineer.
  - 2. Within Slab Above Ground: Use galvanized steel rigid metal conduit (RMC) or rigid PVC conduit. Embed within structural slabs only where approved by Structural Engineer.
  - 3. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), or galvanized steel electrical metallic tubing (EMT) where emerging from concrete.

### **2.02 CONDUIT - GENERAL REQUIREMENTS**

- A. Comply with NFPA 70.
- B. Provide conduit, fittings, supports, and accessories required for complete raceway system.
- C. Provide products listed, classified, and labeled as suitable for purpose intended.
- D. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

**2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)**

- A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.
- B. Fittings:
  - 1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6.
  - 2. Material: Use steel or malleable iron.
  - 3. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

**2.04 STAINLESS STEEL RIGID METAL CONDUIT (RMC)**

- A. Description: NFPA 70, Type RMC stainless steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6A.
- B. Fittings:
  - 1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6A.
  - 2. Material: Use stainless steel with corrosion resistance equivalent to conduit.
  - 3. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

**2.05 GALVANIZED STEEL INTERMEDIATE METAL CONDUIT (IMC)**

- A. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.
- B. Fittings:
  - 1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 1242.
  - 2. Material: Use steel or malleable iron.
  - 3. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

**2.06 STAINLESS STEEL INTERMEDIATE METAL CONDUIT (IMC)**

- A. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.
- B. Fittings:
  - 1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 1242.

**2.07 GALVANIZED STEEL ELECTRICAL METALLIC TUBING (EMT)**

- A. Description: NFPA 70, Type EMT galvanized steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.
- B. Fittings:

1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Material: Use steel or malleable iron.
3. Connectors and Couplings: Use compression/gland or set-screw type.
  - a. Do not use indenter type connectors and couplings.

#### **2.08 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT**

- A. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.
- B. Fittings:
  1. Manufacturer: Same as manufacturer of conduit to be connected.
  2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

#### **2.09 REINFORCED THERMOSETTING RESIN CONDUIT (RTRC)**

- A. Description: NFPA 70, Type RTRC reinforced thermosetting resin conduit complying with NEMA TC 14 (SERIES).
- B. Supports: As recommended by manufacturer.
- C. Fittings: Same type and manufacturer as conduit to be connected.

**END OF SECTION**

**SECTION 260533.16**  
**BOXES FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Outlet and device boxes up to 100 cubic inches (1,650 cu cm), including those used as junction and pull boxes.
- B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches (1,650 cu cm).
- C. Boxes and enclosures for integrated power, data, and audio/video.

**1.02 RELATED REQUIREMENTS**

- A. Section 083100 - Access Doors and Panels: Panels for maintaining access to concealed boxes.
- B. Section 260526 - Grounding and Bonding for Electrical Systems.
- C. Section 260529 - Hangers and Supports for Electrical Systems.
- D. Section 260533.13 - Conduit for Electrical Systems:
  - 1. Conduit bodies and other fittings.
  - 2. Additional requirements for locating boxes to limit conduit length and/or number of bends between pulling points.
- E. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- F. Section 262726 - Wiring Devices:
  - 1. Wall plates.
  - 2. Additional requirements for locating boxes for wiring devices.

**1.03 REFERENCE STANDARDS**

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.
- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- D. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
- E. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013 (Reaffirmed 2020).
- F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- H. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

- I. UL 508A - Industrial Control Panels; Current Edition, Including All Revisions.
- J. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

#### **1.04 ADMINISTRATIVE REQUIREMENTS**

##### **A. Coordination:**

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
6. Coordinate the work with other trades to preserve insulation integrity.
7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
8. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

#### **1.05 SUBMITTALS**

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for cabinets and enclosures.

#### **1.06 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

### **PART 2 PRODUCTS**

#### **2.01 BOXES**

##### **A. General Requirements:**

1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
3. Provide products listed, classified, and labeled as suitable for the purpose intended.

4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
  5. Provide grounding terminals within boxes where equipment grounding conductors terminate.
- B. Outlet and Device Boxes Up to 100 cubic inches (1,650 cu cm), Including Those Used as Junction and Pull Boxes:
1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
  2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
  3. Use suitable concrete type boxes where flush-mounted in concrete.
  4. Use suitable masonry type boxes where flush-mounted in masonry walls.
  5. Use raised covers suitable for the type of wall construction and device configuration where required.
  6. Use shallow boxes where required by the type of wall construction.
  7. Do not use "through-wall" boxes designed for access from both sides of wall.
  8. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
  9. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
  10. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
  11. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
  12. Wall Plates: Comply with Section 262726.
  13. Manufacturers:
    - a. Cooper Crouse-Hinds, a division of Eaton Corporation: [www.cooperindustries.com/#sle](http://www.cooperindustries.com/#sle).
    - b. E-Lids LLC: [www.e-lids.com/#sle](http://www.e-lids.com/#sle).
    - c. Hubbell Incorporated; Bell Products: [www.hubbell-rtb.com/#sle](http://www.hubbell-rtb.com/#sle).
    - d. Hubbell Incorporated; RACO Products: [www.hubbell-rtb.com/#sle](http://www.hubbell-rtb.com/#sle).
    - e. O-Z/Gedney, a brand of Emerson Electric Co: [www.emerson.com/#sle](http://www.emerson.com/#sle).
    - f. Thomas & Betts Corporation: [www.tnb.com/#sle](http://www.tnb.com/#sle).
- C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
  2. NEMA 250 Environment Type, Unless Otherwise Indicated:
    - a. Outdoor Locations: Type 3R, painted steel.
  3. Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):

- a. Provide hinged-cover enclosures unless otherwise indicated.
4. Finish for Painted Steel Enclosures: Manufacturer's standard grey unless otherwise indicated.
5. Manufacturers:
  - a. Cooper B-Line, a division of Eaton Corporation:  
www.cooperindustries.com/#sle.
  - b. Hoffman, a brand of Pentair Technical Products:  
www.hoffmanonline.com/#sle.
- D. Boxes and Enclosures for Integrated Power, Data, and Audio/Video: Size and configuration as indicated or as required with partitions to separate services; field-connected gangable boxes may be used.
  1. Manufacturers:
    - a. Hubbell Incorporated: www.hubbell.com/#sle.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive boxes.
- C. Verify that conditions are satisfactory for installation prior to starting work.

#### **3.02 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.
- E. Box Locations:
  1. Locate boxes to be accessible..
  2. Unless dimensioned, box locations indicated are approximate.
  3. Locate boxes as required for devices installed under other sections or by others.
    - a. Switches, Receptacles, and Other Wiring Devices: Comply with Section 262726.
  4. Locate boxes so that wall plates do not cross masonry joints.
  5. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
  6. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches (150 mm) horizontal separation unless otherwise indicated.

7. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
  8. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 260533.13.
- F. Box Supports:
1. Secure and support boxes in accordance with NFPA 70 and Section 260529 using suitable supports and methods approved by the authority having jurisdiction.
  2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
- G. Install boxes plumb and level.
- H. Flush-Mounted Boxes:
1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch (6 mm) or does not project beyond finished surface.
  2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
  3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch (3 mm) at the edge of the box.
- I. Install boxes as required to preserve insulation integrity.
- J. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- K. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.
- L. Close unused box openings.
- M. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.
- N. Provide grounding and bonding in accordance with Section 260526.

### **3.03 CLEANING**

- A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

### **3.04 PROTECTION**

- A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

**END OF SECTION**

**SECTION 260553**  
**IDENTIFICATION FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Electrical identification requirements.
- B. Identification nameplates and labels.
- C. Wire and cable markers.
- D. Voltage markers.
- E. Underground warning tape.
- F. Warning signs and labels.

**1.02 RELATED REQUIREMENTS**

- A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.
- B. Section 262726 - Wiring Devices - Lutron: Device and wallplate finishes; factory pre-marked wallplates.

**1.03 REFERENCE STANDARDS**

- A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- B. NFPA 70E - Standard for Electrical Safety in the Workplace; 2024.
- C. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.
- B. Sequencing:
  - 1. Do not install identification products until final surface finishes and painting are complete.

**1.05 SUBMITTALS**

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.

**1.06 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.

**1.07 FIELD CONDITIONS**

- A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

## PART 2 PRODUCTS

### 2.01 IDENTIFICATION REQUIREMENTS

#### A. Identification for Equipment:

1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
  - a. Switchboards:
    - 1) Identify ampere rating.
    - 2) Identify voltage and phase.
    - 3) Identify power source and circuit number. Include location when not within sight of equipment.
    - 4) Use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
  - b. Panelboards:
    - 1) Identify ampere rating.
    - 2) Identify voltage and phase.
    - 3) Identify power source and circuit number. Include location.
    - 4) Identify main overcurrent protective device. Use identification label for panelboards with a door. For power distribution panelboards without a door, use identification nameplate.
    - 5) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.
    - 6) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device.
  - c. Transformers:
    - 1) Identify kVA rating.
    - 2) Identify voltage and phase for primary and secondary.
    - 3) Identify load(s) served. Include location when not within sight of equipment.
  - d. Enclosed switches, circuit breakers, and motor controllers:
    - 1) Identify voltage and phase.
    - 2) Identify power source and circuit number. Include location when not within sight of equipment.
  - e. Transfer Switches:
    - 1) Identify voltage and phase.
    - 2) Identify power source and circuit number for both normal power source and standby power source. Include location when not within sight of equipment.
    - 3) Identify load(s) served. Include location when not within sight of equipment.
    - 4) Identify short circuit current rating based on the specific overcurrent protective device type and settings protecting the transfer switch.

- f. Electricity Meters:
    - 1) Identify load(s) metered.
  2. Service Equipment:
    - a. Use identification nameplate to identify each service disconnecting means.
  3. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70 including but not limited to the following.
    - a. Service equipment.
    - b. Elevator control panels.
  4. Arc Flash Hazard Warning Labels: Use warning labels to identify arc flash hazards.
    - a. Minimum Size: 3.5 by 5 inches (89 mm by 127 mm).
    - b. Legend: Include orange header that reads "WARNING", followed by the word message "Arc Flash and Shock Hazard; Appropriate PPE Required; Do not operate controls or open covers without appropriate personal protection equipment; Failure to comply may result in injury or death; Refer to NFPA 70E for minimum PPE requirements" or approved equivalent.
    - c. Service Equipment: Include the following information in accordance with NFPA 70.
      - 1) Nominal system voltage.
      - 2) Date label applied.
  5. Use warning signs to identify electrical hazards for entrances to all buildings, vaults, rooms, or enclosures containing exposed live parts or exposed conductors operating at over 600 V nominal with the word message "DANGER; HIGH VOLTAGE; KEEP OUT".
- B. Identification for Conductors and Cables:
1. Color Coding for Power Conductors 600 V and Less: Comply with Section 260519.
  2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
  3. Use wire and cable markers to identify circuit number or other designation indicated for power, control, and instrumentation conductors and cables at the following locations:
    - a. At each source and load connection.
    - b. Within boxes when more than one circuit is present.
- C. Identification for Raceways:
1. Use identification labels to identify highest voltage present for accessible conduits at maximum intervals of 20 feet (6.1 m).
  2. Use voltage markers, color-coded bands, or factory-painted conduits to identify systems other than normal power system for accessible conduits.

- a. Maximum Intervals: 20 feet (6.1 m).
  - b. Color-Coded Bands: Use field-painting or vinyl color coding electrical tape to mark bands 3 inches (76 mm) wide.
    - 1) Field-Painting: Comply with Section 099123 and 099113.
    - 2) Vinyl Color Coding Electrical Tape: Comply with Section 260519.
  - c. Color Code:
    - 1) Fire Alarm System: Red.
3. Use underground warning tape to identify underground raceways.
- D. Identification for Boxes:
1. Use voltage markers to identify highest voltage present.
  2. Use identification labels or handwritten text using indelible marker to identify circuits enclosed.
- E. Identification for Devices:
1. Wiring Device and Wallplate Finishes: Comply with Section 262726.
  2. Use identification label to identify fire alarm system devices.

## 2.02 IDENTIFICATION NAMEPLATES AND LABELS

- A. Identification Nameplates:
1. Manufacturers:
    - a. Brimar Industries, Inc: [www.brimar.com/#sle](http://www.brimar.com/#sle).
    - b. Kolbi Pipe Marker Co: [www.kolbipipemarkers.com/#sle](http://www.kolbipipemarkers.com/#sle).
    - c. Seton Identification Products: [www.seton.com/#sle](http://www.seton.com/#sle).
  2. Materials:
    - a. Indoor Clean, Dry Locations: Use plastic nameplates.
    - b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.
  3. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch (1.6 mm); engraved text.
  4. Stainless Steel Nameplates: Minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.
  5. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.
  6. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch (25 mm) high; Four, located at corners for larger sizes.
- B. Identification Labels:
1. Manufacturers:
    - a. Brady Corporation: [www.bradyid.com/#sle](http://www.bradyid.com/#sle).
    - b. Brother International Corporation: [www.brother-usa.com/#sle](http://www.brother-usa.com/#sle).
    - c. Panduit Corp: [www.panduit.com/#sle](http://www.panduit.com/#sle).

2. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
  3. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.
- C. Format for Equipment Identification:
1. Minimum Size: 1 inch (25 mm) by 2.5 inches (64 mm).
  2. Legend:
    - a. System designation where applicable:
      - 1) Fire Alarm System: Identify with text "FIRE ALARM".
    - b. Equipment designation or other approved description.
  3. Text: All capitalized unless otherwise indicated.
  4. Minimum Text Height:
    - a. System Designation: 1 inch (25 mm).
    - b. Equipment Designation: 1/2 inch (13 mm).
  5. Color:
    - a. Normal Power System: White text on black background.
    - b. Fire Alarm System: White text on red background.
- D. Format for General Information and Operating Instructions:
1. Minimum Size: 1 inch (25 mm) by 2.5 inches (64 mm).
  2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
  3. Text: All capitalized unless otherwise indicated.
  4. Minimum Text Height: 1/4 inch (6 mm).
  5. Color: Black text on white background unless otherwise indicated.
- E. Format for Caution and Warning Messages:
1. Minimum Size: 2 inches (51 mm) by 4 inches (100 mm).
  2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
  3. Text: All capitalized unless otherwise indicated.
  4. Minimum Text Height: 1/2 inch (13 mm).
  5. Color: Black text on yellow background unless otherwise indicated.
- F. Format for Receptacle Identification (Unit Apartments Not Included):
1. Minimum Size: 3/8 inch (10 mm) by 1.5 inches (38 mm).
  2. Legend: Power source and circuit number or other designation indicated.
  3. Text: All capitalized unless otherwise indicated.
  4. Minimum Text Height: 3/16 inch (5 mm).
  5. Color: Black text on clear background.
- G. Format for Fire Alarm Device Identification:
1. Minimum Size: 3/8 inch (10 mm) by 1.5 inches (38 mm).
  2. Legend: Designation indicated and device zone or address.

3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 3/16 inch (5 mm).
5. Color: Red text on white background.

### **2.03 WIRE AND CABLE MARKERS**

- A. Manufacturers:
  1. Brady Corporation: [www.bradyid.com/#sle](http://www.bradyid.com/#sle).
  2. HellermannTyton: [www.hellermanntyton.com/#sle](http://www.hellermanntyton.com/#sle).
- B. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.
- C. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.
- D. Legend: Power source and circuit number or other designation indicated.
- E. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.
- F. Minimum Text Height: 1/8 inch (3 mm).
- G. Color: Black text on white background unless otherwise indicated.

### **2.04 VOLTAGE MARKERS**

- A. Manufacturers:
  1. Brady Corporation: [www.bradyid.com/#sle](http://www.bradyid.com/#sle).
  2. Brimar Industries, Inc: [www.brimar.com/#sle](http://www.brimar.com/#sle).
  3. Seton Identification Products: [www.seton.com/#sle](http://www.seton.com/#sle).
- B. Markers for Conduits: Use factory pre-printed self-adhesive vinyl, self-adhesive vinyl cloth, or vinyl snap-around type markers.
- C. Markers for Boxes and Equipment Enclosures: Use factory pre-printed self-adhesive vinyl or self-adhesive vinyl cloth type markers.
- D. Minimum Size:
  1. Markers for Conduits: As recommended by manufacturer for conduit size to be identified.
  2. Markers for Pull Boxes: 1 1/8 by 4 1/2 inches (29 by 110 mm).
  3. Markers for Junction Boxes: 1/2 by 2 1/4 inches (13 by 57 mm).
- E. Legend:
  1. Markers for Voltage Identification: Highest voltage present.
  2. Markers for System Identification:
- F. Color: Black text on orange background unless otherwise indicated.

## 2.05 UNDERGROUND WARNING TAPE

- A. Materials: Use non-detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.
- B. Non-detectable Type Tape: 6 inches (152 mm) wide, with minimum thickness of 4 mil (0.1 mm).
- C. Legend: Type of service, continuously repeated over full length of tape.
- D. Color:
  - 1. Tape for Buried Power Lines: Black text on red background.
  - 2. Tape for Buried Communication, Alarm, and Signal Lines: Black text on orange background.

## 2.06 WARNING SIGNS AND LABELS

- A. Manufacturers:
  - 1. Brimar Industries, Inc: [www.brimar.com/#sle](http://www.brimar.com/#sle).
  - 2. Clarion Safety Systems, LLC: [www.clarionsafety.com/#sle](http://www.clarionsafety.com/#sle).
  - 3. Insite Solutions, LLC: [www.stop-painting.com/#sle](http://www.stop-painting.com/#sle).
  - 4. Seton Identification Products: [www.seton.com/#sle](http://www.seton.com/#sle).
- B. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.
- C. Warning Signs:
  - 1. Materials:
    - a. Indoor Dry, Clean Locations: Use factory pre-printed rigid plastic or self-adhesive vinyl signs.
  - 2. Rigid Signs: Provide four mounting holes at corners for mechanical fasteners.
  - 3. Minimum Size: 7 by 10 inches (178 by 254 mm) unless otherwise indicated.
- D. Warning Labels:
  - 1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
  - 2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
  - 3. Minimum Size: 2 by 4 inches (51 mm by 102 mm) unless otherwise indicated.

## PART 3 EXECUTION

### 3.01 PREPARATION

- A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

### 3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
  - 1. Surface-Mounted Equipment: Enclosure front.

2. Flush-Mounted Equipment: Inside of equipment door.
  3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
  4. Elevated Equipment: Legible from the floor or working platform.
  5. Branch Devices: Adjacent to device.
  6. Interior Components: Legible from the point of access.
  7. Conduits: Legible from the floor.
  8. Boxes: Outside face of cover.
  9. Conductors and Cables: Legible from the point of access.
  10. Devices: Outside face of cover.
- C. Install identification products centered, level, and parallel with lines of item being identified.
- D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.
- E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.
- F. Install underground warning tape above buried lines with one tape per trench at 3 inches (75 mm) below finished grade.
- G. Secure rigid signs using stainless steel screws.
- H. Mark all handwritten text, where permitted, to be neat and legible.

### **3.03 FIELD QUALITY CONTROL**

- A. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

**END OF SECTION**

**SECTION 260923  
LIGHTING CONTROL DEVICES**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Occupancy sensors.

**1.02 RELATED REQUIREMENTS**

- A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables.
- B. Section 260529 - Hangers and Supports for Electrical Systems
- C. Section 260533.16 - Boxes for Electrical Systems.
- D. Section 262726 - Wiring Devices: Devices for manual control of lighting, including wall switches, wall dimmers, and fan speed controllers.
- E. Section 265100 - Interior Lighting.

**1.03 REFERENCE STANDARDS**

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate placement of lighting control devices with millwork, furniture, equipment and other potential conflicts.
  - 2. Coordinate placement of wall switch occupancy sensors with installed door swings.
  - 3. Coordinate placement of occupancy sensors with millwork, furniture, equipment and other potential obstructions to motion detection coverage.
  - 4. Coordinate lighting control device product selections with luminaire characteristics; see Section 265100 and lighting fixture schedule.
  - 5. Notify Architect of conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.
- B. Sequencing:
  - 1. Do not install lighting control devices until final surface finishes and painting are complete.

**1.05 SUBMITTALS**

- A. Product Data: Include ratings, operating modes or sequence of functions, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.
  - 1. Occupancy Sensors: Include detailed motion detection coverage range diagrams.

- B. Field quality control reports.
- C. Operation and Maintenance Data: Include detailed information on device programming and setup.

#### **1.06 QUALITY ASSURANCE**

- A. Comply with NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

#### **1.07 DELIVERY, STORAGE, AND PROTECTION**

- A. Store products in clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation.

#### **1.08 FIELD CONDITIONS**

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

#### **1.09 WARRANTY**

- A. Provide five year manufacturer warranty for occupancy sensors.

### **PART 2 PRODUCTS**

#### **2.01 LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS**

- A. Provide products listed, classified, and labeled as suitable for purpose intended.
- B. Unless specifically indicated as excluded, provide components necessary for complete operating system including, but not limited to, conduit, wiring, connectors, hardware, and accessories.

#### **2.02 OCCUPANCY SENSORS**

- A. Manufacturers:
  - 1. Acuity Brands, Inc: [www.acuitybrands.com/#sle](http://www.acuitybrands.com/#sle).
  - 2. Hubbell Incorporated: [www.hubbell.com/#sle](http://www.hubbell.com/#sle).
  - 3. Intermatic, Inc: [www.intermatic.com/#sle](http://www.intermatic.com/#sle).
  - 4. Legrand North America, Inc: [www.legrand.us/#sle](http://www.legrand.us/#sle).
  - 5. Lutron Electronics Company, Inc: [www.lutron.com/#sle](http://www.lutron.com/#sle).
- B. General Requirements:
  - 1. Description: Factory-assembled commercial specification grade devices for indoor use capable of sensing both major motion, such as walking, and minor motion, such as small desktop level movements, according to published coverage areas, for automatic control of load indicated.
  - 2. Sensor Technology:
    - a. Passive Infrared/Ultrasonic Dual Technology Occupancy Sensors: Designed to detect occupancy using combination of both passive infrared and ultrasonic technologies.

3. Provide LED to visually indicate motion detection with separate color LEDs for each sensor type in dual technology units.
  4. Operation: Unless otherwise indicated, occupancy sensor to turn load on when occupant presence is detected and to turn load off when no occupant presence is detected during adjustable turn-off delay time interval.
  5. Turn-Off Delay: Field adjustable, with time delay settings up to 30 minutes.
  6. Compatibility (Non-Dimming Sensors): Suitable for controlling incandescent lighting, low-voltage lighting with electronic and magnetic transformers, fluorescent lighting with electronic and magnetic ballasts, and fractional motor loads, with no minimum load requirements.
- C. Wall Switch Occupancy Sensors:
1. General Requirements:
    - a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with field of view of 180 degrees, integrated manual control capability, and no leakage current to load in off mode.
    - b. Manual-Off Override Control: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during delayed-off time interval.
  2. Passive Infrared/Ultrasonic Dual Technology Wall Switch Occupancy Sensors: Capable of detecting motion within area of 900 square feet (83.6 sq m).
    - a. Products:
      - 1) Lutron Maestro Series; [www.lutron.com/#sle](http://www.lutron.com/#sle).
- D. Ceiling Mounted Occupancy Sensors:
1. General Requirements:
    - a. Description: Low profile occupancy sensors designed for ceiling installation.
  2. Passive Infrared/Ultrasonic Dual Technology Ceiling Mounted Occupancy Sensors:
    - a. Standard Range Sensors: Capable of detecting motion within area of 450 square feet (41.8 sq m) at mounting height of 9 feet (2.7 m), with field of view of 360 degrees.
      - 1) Products:
        - (a) Lutron LOS-CDT Series; [www.lutron.com/#sle](http://www.lutron.com/#sle).
- E. Luminaire Mounted Occupancy Sensors: Designed for direct luminaire installation and control, suitable for use with specified luminaires.
- F. Power Packs for Low-Voltage Occupancy Sensors:
1. Description: Plenum rated, self-contained low-voltage class 2 transformer and relay compatible with specified low-voltage occupancy sensors for switching of line-voltage loads.
  2. Provide quantity and configuration of power and slave packs with associated wiring and accessories as required to control load indicated on drawings.

3. Input Supply Voltage: Dual rated for 120/277 V ac.
4. Load Rating: As required to control load indicated on drawings.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
- C. Verify that openings for outlet boxes are neatly cut and will be completely covered by devices or wall plates.
- D. Verify that final surface finishes are complete, including painting.
- E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to lighting control devices.
- F. Verify that service voltage and ratings of lighting control devices are appropriate for service voltage and load requirements at location to be installed.
- G. Verify that conditions are satisfactory for installation prior to starting work.

#### **3.02 PREPARATION**

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

#### **3.03 INSTALLATION**

- A. Install lighting control devices in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
- B. Coordinate locations of outlet boxes as required for installation of lighting control devices; see Section 260533.16.
- C. Maintain separation of remote-control, signaling, and power-limited circuits.
  1. See manufacturer instructions and Section 260519 for control wiring conductors, wiring methods, and identification requirements.
- D. Install lighting control devices in accordance with manufacturer's instructions.
- E. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
- F. Install lighting control devices plumb and level, and held securely in place.
- G. Where required and not furnished with lighting control device, provide wall plate; see Section 262726.
- H. Provide required supports; see Section 260529.

- I. Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
- J. Occupancy Sensor Locations:
  - 1. Locate ultrasonic and dual technology passive infrared/ultrasonic occupancy sensors minimum of 4 feet (1.2 m) from air supply ducts or other sources of heavy air flow and as per manufacturer's recommendations, in order to minimize false triggers.

### **3.04 FIELD QUALITY CONTROL**

- A. Inspect each lighting control device for damage and defects.
- B. Test occupancy sensors to verify proper operation, including time delays and ambient light thresholds where applicable. Verify optimal coverage for entire room or area. Record test results in written report to be included with submittals.
- C. Correct wiring deficiencies and replace damaged or defective conductors, cables, and lighting control devices.

### **3.05 ADJUSTING**

- A. Adjust devices and wall plates to be flush and level.
- B. Adjust occupancy sensor settings to minimize undesired activations while optimizing energy savings, and to achieve desired function as indicated or as directed by Architect.
- C. Where indicated or as directed by Architect, install factory masking material or adjust integral blinders on passive infrared (PIR) and dual technology occupancy sensor lenses to block undesired motion detection.

### **3.06 CLEANING**

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

### **3.07 CLOSEOUT ACTIVITIES**

- A. Demonstration: Demonstrate proper operation of lighting control devices to Architect, and correct deficiencies or make adjustments as directed.

**END OF SECTION**

**SECTION 261116**  
**SECONDARY UNIT SUBSTATIONS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Unit substation.

**1.02 RELATED REQUIREMENTS**

- A. Section 260529 - Hangers and Supports for Electrical Systems.

**1.03 REFERENCE STANDARDS**

- A. IEEE C37.04 - IEEE Standard for Ratings and Requirements for AC High-Voltage Circuit Breakers with Rated Maximum Voltage Above 1000 V; 2018 (Corrigendum 2021).
- B. IEEE C37.20.2 - IEEE Standard for Metal-Clad Switchgear; 2022.
- C. IEEE C37.20.3 - IEEE Standard for Metal-Enclosed Interrupter Switchgear Rated above 1 kV AC up to and Including 48.3 kV AC; 2023.
- D. IEEE C57.12.28 - IEEE Standard for Pad-Mounted Equipment--Enclosure Integrity; 2023.
- E. IEEE C57.94 - IEEE Recommended Practice for Installation, Application, Operation, and Maintenance of Dry-Type Distribution and Power Transformers; 2015.
- F. NEMA PB 2 - Deadfront Distribution Switchboards; 2011.
- G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

**1.04 SUBMITTALS**

- A. Shop Drawings: Indicate electrical characteristics and connection requirements, outline dimensions, connection and support points, weight, specified ratings and materials.

**1.05 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.
- B. Products: Listed, classified, and labeled as suitable for the purpose intended.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Protect products from weather and moisture by covering with heavy plastic or canvas and by maintaining heating within enclosure in accordance with manufacturer's instructions.

**PART 2 PRODUCTS****2.01 MANUFACTURERS**

- A. ABB: [www.electrification.us.abb.com/#sle](http://www.electrification.us.abb.com/#sle).
- B. Eaton Corporation: [www.eaton.com/#sle](http://www.eaton.com/#sle).

- C. Schneider Electric: [www.se.com/#sle](http://www.se.com/#sle).
- D. Siemens Industry, Inc: [www.new.siemens.com/#sle](http://www.new.siemens.com/#sle).

## **2.02 UNIT SUBSTATIONS**

- A. Description: Secondary unit substation comprising circuit breaker primary section, transformer section, metering section, and low-voltage switchboard secondary section.
- B. Configuration: Radial type .

## **2.03 SERVICE CONDITIONS**

- A. Meet requirements for usual service conditions and for the specified unusual service conditions.

## **2.04 PRIMARY CIRCUIT BREAKER RATINGS**

- A. Voltage and Insulation Levels: Comply with IEEE C37.20.1.
- B. Momentary Current Rating: To IEEE C37.20.1.

## **2.05 TRANSFORMER RATINGS**

- A. Capacity: 2000 kVA.
- B. Taps: Standard primary taps.
- C. Secondary Voltage: 208 volts, wye connected.
- D. Impedance: 5.75 percent.
- E. Basic Impulse Level: 30 kV.

## **2.06 INCOMING SECTION EQUIPMENT**

- A. Primary cover bushings.
- B. Fused Air Interrupter Switch: IEEE C37.20.3, two position.
- C. Metal-Clad Switchgear: IEEE C37.20.2.
- D. Configuration: One incoming lines .
- E. Basic Impulse Level: 95 kV.

## **2.07 DRY TYPE TRANSFORMERS**

- A. Dry-Type Transformers: Single phase, pad-mounted, self-cooled transformer unit with solid-cast windings.

## **2.08 OUTGOING SECTION EQUIPMENT**

- A. Description: Switchboard manufactured to NEMA PB 2.
- B. Line and Load Terminations: Accessible from the front only, suitable for the conductor materials used.
- C. Main Section Devices: Panel mounted.
- D. Distribution Section Devices: Panel mounted.
- E. Bus Material: Copper.

- F. Bus Connections: Bolted, accessible from front for maintenance.
- G. Field-Adjustable Trip Circuit Breaker: Provide circuit breakers with frame sizes 200 amperes and larger with mechanism for adjusting long time continuous current short time pickup current setting for automatic operation.
  - 1. Range of Adjustment: 2-27 seconds.
  - 2. Field-Changeable Ampere Rating Circuit Breaker: Provide circuit breakers with frame sizes 200 amperes and larger with changeable trip units.
  - 3. Current Limiting Circuit Breaker: Provide circuit breaker as indicated with automatically-resetting current limiting elements in each pole. Let-through current and energy shall be less than permitted for same size Class RK-5 fuse.

## **2.09 POWER CIRCUIT BREAKERS AND CIRCUIT BREAKER SWITCHGEAR**

- A. Circuit Breaker: IEEE C37.04.
- B. Circuit Breaker Operator: Spring-charged stored energy .
- C. Rated Maximum Voltage: 5.0 kV.
- D. Rated Voltage Range Factor: 1.3.
- E. Rated Frequency: 60 Hz.

## **2.10 FABRICATION**

- A. Enclosure: Comply with requirements of IEEE C57.12.28.
- B. Construction: Indoor.
- C. Main Bus: Aluminum.

## **2.11 FACTORY FINISHES**

- A. Clean surfaces before applying paint.
- B. Apply corrosion-resisting primer to all surfaces.
- C. Apply finish coat of baked enamel paint to 2 mils (0.5 mm) thick.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install in accordance with IEEE C57.94.
- B. Provide required support and attachment in accordance with Section 260529.
- C. Install substation plumb and level and with each section aligned properly.
- D. Make electrical connections between equipment sections using connectors furnished by manufacturer.

**END OF SECTION**

**SECTION 262416  
PANELBOARDS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Power distribution panelboards.
- B. Lighting and appliance panelboards.
- C. Load centers.
- D. Overcurrent protective devices for panelboards.

**1.02 RELATED REQUIREMENTS**

- A. Section 260526 - Grounding and Bonding for Electrical Systems.
- B. Section 260529 - Hangers and Supports for Electrical Systems.
- C. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- D. Section 264300 - Surge Protective Devices.

**1.03 REFERENCE STANDARDS**

- A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e, with Amendments (2022).
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- C. NECA 407 - Standard for Installing and Maintaining Panelboards; 2015.
- D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- E. NEMA PB 1 - Panelboards; 2011.
- F. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 1000V or Less; 2023.
- G. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.
- H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- J. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- K. UL 67 - Panelboards; Current Edition, Including All Revisions.
- L. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.
- M. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

N. UL 1699 - Arc-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

#### **1.04 ADMINISTRATIVE REQUIREMENTS**

A. Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.
4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

#### **1.05 SUBMITTALS**

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.

#### **1.06 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.
- B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

#### **1.08 FIELD CONDITIONS**

- A. Maintain ambient temperature within the following limits during and after installation of panelboards:
1. Panelboards Containing Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. ABB: [www.electrification.us.abb.com/#sle](http://www.electrification.us.abb.com/#sle).

- B. Eaton Corporation: [www.eaton.com/#sle](http://www.eaton.com/#sle).
- C. Schneider Electric: [www.se.com/#sle](http://www.se.com/#sle).
- D. Siemens Industry, Inc: [www.new.siemens.com/#sle](http://www.new.siemens.com/#sle).

## 2.02 PANELBOARDS - GENERAL REQUIREMENTS

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
  - 1. Altitude: Less than 6,600 feet (2,000 m).
  - 2. Ambient Temperature:
    - a. Panelboards Containing Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).
- C. Short Circuit Current Rating:
- D. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.
- E. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.
- F. Bussing: Sized in accordance with UL 67 temperature rise requirements.
  - 1. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
- G. Conductor Terminations: Suitable for use with the conductors to be installed.
- H. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
  - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
  - 2. Boxes: Galvanized steel unless otherwise indicated.
    - a. Provide wiring gutters sized to accommodate the conductors to be installed.
  - 3. Fronts:
    - a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
    - b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.
  - 4. Lockable Doors: All locks keyed alike unless otherwise indicated.
- I. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.
- J. Surge Protective Devices: Where factory-installed, internally mounted surge protective devices are provided in accordance with Section 264300, list and label panelboards as a complete assembly including surge protective device.

### 2.03 POWER DISTRIBUTION PANELBOARDS

- A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.
- B. Conductor Terminations:
  - 1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
  - 2. Main and Neutral Lug Type: Mechanical.
- C. Bussing:
  - 1. Phase and Neutral Bus Material: Aluminum.
  - 2. Ground Bus Material: Aluminum.
- D. Circuit Breakers:
  - 1. Provide bolt-on type or plug-in type secured with locking mechanical restraints.
- E. Enclosures:
  - 1. Provide surface-mounted enclosures unless otherwise indicated.

### 2.04 LIGHTING AND APPLIANCE PANELBOARDS

- A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.
- B. Conductor Terminations:
  - 1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
  - 2. Main and Neutral Lug Type: Mechanical.
- C. Bussing:
  - 1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
  - 2. Phase and Neutral Bus Material: Aluminum.
  - 3. Ground Bus Material: Aluminum.
- D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.
- E. Enclosures:
  - 1. Provide surface-mounted or flush-mounted enclosures as indicated.
  - 2. Provide clear plastic circuit directory holder mounted on inside of door.

### 2.05 LOAD CENTERS

- A. Description: Circuit breaker type load centers listed and labeled as complying with UL 67; ratings, configurations, and features as indicated on the drawings.
- B. Bussing:
  - 1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.

2. Bus Material: Aluminum or copper.
- C. Circuit Breakers: Thermal magnetic plug-in type.
- D. Enclosures:
  1. Provide surface-mounted or flush-mounted enclosures unless otherwise indicated.
  2. Fronts: Provide hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
  3. Provide circuit directory label on inside of door or individual circuit labels adjacent to circuit breakers.

## 2.06 OVERCURRENT PROTECTIVE DEVICES

- A. Molded Case Circuit Breakers:
  1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
  2. Interrupting Capacity:
    - a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
    - b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
  3. Conductor Terminations:
    - a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
  4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
  5. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.
  6. Provide the following circuit breaker types where indicated:
    - a. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.
    - b. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Combination type listed as complying with UL 1699.
    - c. 100 Percent Rated Circuit Breakers: Listed for application within the panelboard where installed at 100 percent of the continuous current rating.
  7. Do not use tandem circuit breakers.
  8. Provide the following features and accessories where indicated or where required to complete installation:
    - a. Handle Pad-Lock Provision: For locking circuit breaker handle in OFF position.

**PART 3 EXECUTION****3.01 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive panelboards.
- D. Verify that conditions are satisfactory for installation prior to starting work.

**3.02 INSTALLATION**

- A. Perform work in accordance with NECA 1 (general workmanship).
- B. Install products in accordance with manufacturer's instructions.
- C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.
- D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- E. Provide required support and attachment in accordance with Section 260529.
- F. Install panelboards plumb.
- G. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.
- H. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches (2000 mm) above the floor or working platform.
- I. Provide minimum of six spare 1 inch (27 mm) trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling and below floor.
- J. Provide grounding and bonding in accordance with Section 260526.
- K. Install all field-installed branch devices, components, and accessories.
- L. Provide filler plates to cover unused spaces in panelboards.
- M. Provide circuit breaker lock-on devices to prevent unauthorized personnel from de-energizing essential loads where indicated. Also provide for the following:
  - 1. Fire detection and alarm circuits.
  - 2. Intrusion detection and access control system circuits.
  - 3. Video surveillance system circuits.
- N. Identify panelboards in accordance with Section 260553.

**3.03 FIELD QUALITY CONTROL**

- A. Inspect and test in accordance with NETA ATS, except Section 4.
- B. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers. Tests listed as optional are not required.
- C. Test GFCI circuit breakers to verify proper operation.

- D. Test AFCI circuit breakers to verify proper operation.
- E. Correct deficiencies and replace damaged or defective panelboards or associated components.

#### **3.04 ADJUSTING**

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.
- B. Adjust alignment of panelboard fronts.

#### **3.05 CLEANING**

- A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

**END OF SECTION**

**SECTION 262726  
WIRING DEVICES**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Wall switches.
- B. Wall dimmers.
- C. Receptacles.
- D. Wall plates and covers.

**1.02 RELATED REQUIREMENTS**

- A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Manufactured wiring systems for use with access floor boxes with compatible pre-wired connectors.
- B. Section 260526 - Grounding and Bonding for Electrical Systems.
- C. Section 260533.16 - Boxes for Electrical Systems.
- D. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- E. Section 260923 - Lighting Control Devices: Devices for automatic control of lighting, including occupancy sensors.
- F. Section 262913 - Enclosed Controllers: Manual motor starters and horsepower rated motor-starting switches without overload protection.

**1.03 REFERENCE STANDARDS**

- A. FS W-C-596 - Connector, Electrical, Power, General Specification for; 2014h (Validated 2022).
- B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush Mounted (General Specification); 2017g (Validated 2023).
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- D. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.
- E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- F. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2020).
- G. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2021.
- H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.
- J. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.
- K. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.

- L. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.
- M. UL 1310 - Class 2 Power Units; Current Edition, Including All Revisions.
- N. UL 1449 - Standard for Surge Protective Devices; Current Edition, Including All Revisions.
- O. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.

#### **1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
  - 2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
  - 3. Coordinate the placement of outlet boxes for wall switches with actual installed door swings.
  - 4. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
  - 5. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.
- B. Sequencing:

#### **1.05 SUBMITTALS**

- A. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

#### **1.06 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.
- B. Products: Listed, classified, and labeled as suitable for the purpose intended.

#### **1.07 DELIVERY, STORAGE, AND PROTECTION**

- A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.

### **PART 2 PRODUCTS**

#### **2.01 WIRING DEVICES - GENERAL REQUIREMENTS**

- A. Provide wiring devices suitable for intended use with ratings adequate for load served.
- B. Wiring Device Applications:
  - 1. Receptacles Installed Outdoors or in Damp or Wet Locations: Use weather-resistant GFCI receptacles with weatherproof covers.
  - 2. Receptacles Installed in Dwelling Units: Use tamper-resistant receptacles.
  - 3. Provide GFCI protection for:
    - a. Receptacles installed within 6 feet (1.8 m) of sinks.

b. Receptacles installed in kitchens.

C. Wiring Device Finishes:

1. Provide wiring device finishes as described below, unless otherwise indicated.
2. Wiring Devices, Unless Otherwise Indicated: Color selection by Architect.
3. Wiring Devices Installed in Unfinished Spaces: Gray with galvanized steel wall plate.
4. Wiring Devices Installed in Wet or Damp Locations: White with weatherproof cover.

## 2.02 WALL SWITCHES

A. Manufacturers:

1. Hubbell Incorporated: [www.hubbell.com/#sle](http://www.hubbell.com/#sle).
2. Pass & Seymour, a brand of Legrand North America, Inc: [www.legrand.us/#sle](http://www.legrand.us/#sle).

B. Wall Switches - General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.

1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.

## 2.03 WALL DIMMERS

A. Manufacturers:

1. Leviton Manufacturing Company, Inc: [www.leviton.com/#sle](http://www.leviton.com/#sle).
2. Lutron Electronics Company, Inc; Maestro Series: [www.lutron.com/#sle](http://www.lutron.com/#sle).
3. Pass & Seymour, a brand of Legrand North America, Inc: [www.legrand.us/#sle](http://www.legrand.us/#sle).

B. Wall Dimmers - General Requirements: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 1472; types and ratings suitable for load controlled as indicated on the drawings.

C. Control: Slide control type with separate on/off switch.

D. Provide locator light, illuminated with load off.

E. Provide accessory wall switches to match dimmer appearance when installed adjacent to each other.

## 2.04 RECEPTACLES

A. Manufacturers:

1. Hubbell Incorporated: [www.hubbell.com/#sle](http://www.hubbell.com/#sle).
2. Leviton Manufacturing Company, Inc: [www.leviton.com/#sle](http://www.leviton.com/#sle).
3. Lutron Electronics Company, Inc; Designer Style: [www.lutron.com/#sle](http://www.lutron.com/#sle).
4. Pass & Seymour, a brand of Legrand North America, Inc: [www.legrand.us/#sle](http://www.legrand.us/#sle).

- B. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.
1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
  2. NEMA configurations specified are according to NEMA WD 6.
- C. Convenience Receptacles:
1. Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.
    - a. Products:
      - 1) Hubbell Incorporated; EdgeConnect Series: [www.hubbell.com/#sle](http://www.hubbell.com/#sle).
  2. Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.
    - a. Products:
      - 1) Hubbell Incorporated; EdgeConnect Series: [www.hubbell.com/#sle](http://www.hubbell.com/#sle).
  3. Tamper Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; single or duplex as indicated on the drawings.
    - a. Products:
      - 1) Hubbell Incorporated; EdgeConnect Series: [www.hubbell.com/#sle](http://www.hubbell.com/#sle).
- D. GFCI Receptacles:
1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.
  2. Standard GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.
    - a. Products:
      - 1) Hubbell Incorporated: [www.hubbell.com/#sle](http://www.hubbell.com/#sle).
  3. Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations.
  4. Tamper Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type.
  5. Tamper Resistant and Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type and as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet

locations.

- E. USB Charging Devices:
  - 1. USB Charging Devices - General Requirements: Listed as complying with UL 1310.
    - a. Charging Capacity - Two-Port Devices: 2.1 A, minimum.
  - 2. USB Charging/Tamper Resistant Receptacle Combination Devices: Two-port (Type A) USB charging device and receptacle, commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; rectangular decorator style.
    - a. Products:
      - 1) Hubbell Incorporated: [www.hubbell.com/#sle](http://www.hubbell.com/#sle).
- F. Locking Receptacles: Industrial specification grade, configuration as indicated on the drawings.
  - 1. Standard Locking Convenience Receptacles: Single, 20A, 125V, NEMA L5-20R.
    - a. Products:
      - 1) Hubbell Incorporated; EdgeConnect Series: [www.hubbell.com/#sle](http://www.hubbell.com/#sle).

## 2.05 WALL PLATES AND COVERS

- A. Manufacturers:
  - 1. Hubbell Incorporated: [www.hubbell-wiring.com/#sle](http://www.hubbell-wiring.com/#sle).
  - 2. Intermatic, Inc: [www.intermatic.com/#sle](http://www.intermatic.com/#sle).
  - 3. Leviton Manufacturing Company, Inc: [www.leviton.com/#sle](http://www.leviton.com/#sle).
  - 4. Lutron Electronics Company, Inc: [www.lutron.com/#sle](http://www.lutron.com/#sle).
  - 5. Pass & Seymour, a brand of Legrand North America, Inc: [www.legrand.us/#sle](http://www.legrand.us/#sle).
- B. Wall Plates: Comply with UL 514D.
  - 1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
  - 2. Size: Standard.
  - 3. Screws: Metal with slotted heads finished to match wall plate finish.
- C. Nylon Wall Plates: Smooth finish, high-impact thermoplastic.
- D. Stainless Steel Wall Plates: Brushed satin finish, Type 302 stainless steel.
- E. Galvanized Steel Wall Plates: Rounded corners and edges, with corrosion resistant screws.
- F. Weatherproof Receptacle Covers for Damp Locations: Gasketed, cast aluminum, with self-closing hinged cover and corrosion-resistant screws; listed as suitable for use in wet locations with cover closed.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that field measurements are as indicated.

- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
- C. Verify that wall openings are neatly cut and will be completely covered by wall plates.
- D. Verify that final surface finishes are complete, including painting.
- E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
- F. Verify that conditions are satisfactory for installation prior to starting work.

### 3.02 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

### 3.03 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
- B. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of wiring devices provided under this section.
- C. Install wiring devices in accordance with manufacturer's instructions.
- D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- E. Where required, connect wiring devices using pigtails not less than 6 inches (150 mm) long. Do not connect more than one conductor to wiring device terminals.
- F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.
- G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
- H. Provide GFCI receptacles with integral GFCI protection at each location indicated. Do not use feed-through wiring to protect downstream devices.
- I. Where split-wired duplex receptacles are indicated, remove tabs connecting top and bottom receptacles.
- J. Install wiring devices plumb and level with mounting yoke held rigidly in place.
- K. Install wall switches with OFF position down.
- L. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.
- M. Do not share neutral conductor on branch circuits utilizing wall dimmers.

- N. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.
- O. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
- P. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.

#### **3.04 FIELD QUALITY CONTROL**

- A. Inspect each wiring device for damage and defects.
- B. Operate each wall switch, wall dimmer, and fan speed controller with circuit energized to verify proper operation.
- C. Test each receptacle to verify operation and proper polarity.
- D. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.
- E. Correct wiring deficiencies and replace damaged or defective wiring devices.

#### **3.05 ADJUSTING**

- A. Adjust devices and wall plates to be flush and level.

#### **3.06 CLEANING**

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

**END OF SECTION**

**SECTION 262816.16  
ENCLOSED SWITCHES**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Enclosed safety switches.

**1.02 RELATED REQUIREMENTS**

- A. Section 260526 - Grounding and Bonding for Electrical Systems.
- B. Section 260529 - Hangers and Supports for Electrical Systems.
- C. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- D. Section 262913 - Enclosed Controllers: Manual motor controllers.
- E. Section 263600 - Transfer Switches: Automatic and non-automatic switches listed for use as transfer switch equipment.

**1.03 REFERENCE STANDARDS**

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- C. NEMA BS 31047 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013 (Reaffirmed 2023).
- D. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.
- E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- G. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- H. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
  - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
  - 3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.

4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

#### **1.05 SUBMITTALS**

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.

#### **1.06 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed switch internal components, enclosure, and finish.

#### **1.08 FIELD CONDITIONS**

- A. Maintain ambient temperature between -22 degrees F (-30 degrees C) and 104 degrees F (40 degrees C) during and after installation of enclosed switches.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. ABB: [www.electrification.us.abb.com/#sle](http://www.electrification.us.abb.com/#sle).
- B. Eaton Corporation: [www.eaton.com/#sle](http://www.eaton.com/#sle).
- C. Schneider Electric: [www.se.com/#sle](http://www.se.com/#sle).
- D. Siemens Industry, Inc: [www.new.siemens.com/#sle](http://www.new.siemens.com/#sle).

#### **2.02 ENCLOSED SAFETY SWITCHES**

- A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
  1. Altitude: Less than 6,600 feet (2,000 m).
  2. Ambient Temperature: Between -22 degrees F (-30 degrees C) and 104 degrees F (40 degrees C).
- D. Horsepower Rating: Suitable for connected load.
- E. Voltage Rating: Suitable for circuit voltage.
- F. Short Circuit Current Rating:
  1. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current

rating not less than the available fault current at the installed location as indicated on the drawings.

- G. Provide with switch blade contact position that is visible when the cover is open.
- H. Conductor Terminations: Suitable for use with the conductors to be installed.
- I. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.
- J. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
  - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
- K. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.
- L. Heavy Duty Switches:
  - 1. Products:
  - 2. Comply with NEMA BS 31047.
  - 3. Conductor Terminations:
    - a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
  - 4. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.
- M. Provide the following features and accessories where indicated or where required to complete installation:
  - 1. Auxiliary Switch: SPDT switch suitable for connection to system indicated, with auxiliary contact operation before switch blades open and after switch blades close.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings of the enclosed switches are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive enclosed safety switches.
- D. Verify that conditions are satisfactory for installation prior to starting work.

### **3.02 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide required support and attachment in accordance with Section 260529.

- E. Install enclosed switches plumb.
- F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches (2000 mm) above the floor or working platform.
- G. Provide grounding and bonding in accordance with Section 260526.

### **3.03 FIELD QUALITY CONTROL**

- A. Inspect and test in accordance with NETA ATS, except Section 4.
- B. Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.
- C. Correct deficiencies and replace damaged or defective enclosed safety switches or associated components.

### **3.04 ADJUSTING**

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

### **3.05 CLEANING**

- A. Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

**END OF SECTION**

**SECTION 262913  
ENCLOSED CONTROLLERS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Enclosed NEMA controllers for low-voltage (600 V and less) applications:
  - 1. Magnetic motor starters.
  - 2. General purpose contactors.
  - 3. Manual motor starters.
  - 4. Motor-starting switches without overload protection.
- B. Overcurrent protective devices for motor controllers, including overload relays.
- C. Control accessories:
  - 1. Auxiliary contacts.
  - 2. Pilot devices.

**1.02 RELATED REQUIREMENTS**

- A. Section 260526 - Grounding and Bonding for Electrical Systems.
- B. Section 260529 - Hangers and Supports for Electrical Systems.
- C. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

**1.03 REFERENCE STANDARDS**

- A. IEEE C57.13 - IEEE Standard Requirements for Instrument Transformers; 2016.
- B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- C. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2008 (Reaffirmed 2020).
- D. NEMA ICS 6 - Industrial Control and Systems: Enclosures; 1993 (Reaffirmed 2016).
- E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. UL 60947-1 - Low-Voltage Switchgear and Controlgear - Part 1: General Rules; Current Edition, Including All Revisions.
- G. UL 60947-4-1 - Low-Voltage Switchgear and Controlgear - Part 4-1: Contactors and Motor-starters - Electromechanical Contactors and Motor-starters; Current Edition, Including All Revisions.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.

2. Coordinate the work to provide motor controllers and associated overload relays suitable for use with the actual motors to be installed.
3. Coordinate the work to provide controllers and associated wiring suitable for interface with control devices to be installed.
4. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
5. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
6. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

#### **1.05 SUBMITTALS**

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for motor controllers, enclosures, overcurrent protective devices, and other installed components and accessories.

#### **1.06 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to internal components, enclosure, and finish.

#### **1.08 FIELD CONDITIONS**

- A. Maintain field conditions within required service conditions during and after installation.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. ABB: [www.electrification.us.abb.com/#sle](http://www.electrification.us.abb.com/#sle).
- B. Eaton Corporation: [www.eaton.com/#sle](http://www.eaton.com/#sle).
- C. Rockwell Automation, Inc: [www.rockwellautomation.com/#sle](http://www.rockwellautomation.com/#sle).
- D. Schneider Electric: [www.se.com/#sle](http://www.se.com/#sle).
- E. Siemens Industry, Inc: [www.new.siemens.com/#sle](http://www.new.siemens.com/#sle).

#### **2.02 ENCLOSED CONTROLLERS**

- A. Provide enclosed controller assemblies consisting of all required components, control power transformers, instrumentation and control wiring, accessories, etc. as necessary for a complete operating system.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.

- C. Description: Enclosed controllers complying with NEMA ICS 2, and listed and labeled as complying with UL 60947-1 and UL 60947-4-1; ratings, configurations and features as indicated on the drawings.
- D. Service Conditions:
  - 1. Provide controllers and associated components suitable for operation under the following service conditions without derating:
    - a. Altitude:
      - 1) Class 1 Km Equipment (devices utilizing power semiconductors, e.g. variable frequency controllers): Less than 3,300 feet (1,000 m).
      - 2) Class 2 Km Equipment (electromagnetic and manual devices): Less than 6,600 feet (2,000 m).
    - b. Ambient Temperature: Between 32 degrees F (0 degrees C) and 104 degrees F (40 degrees C).
  - 2. Provide controllers and associated components suitable for operation at indicated ratings under the service conditions at the installed location.
- E. Short Circuit Current Rating:
- F. Conductor Terminations: Suitable for use with the conductors to be installed.
- G. Enclosures:
  - 1. Comply with NEMA ICS 6.
  - 2. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
  - 3. Finish: Manufacturer's standard unless otherwise indicated.
- H. Instrument Transformers:
  - 1. Comply with IEEE C57.13.
  - 2. Select suitable ratio, burden, and accuracy as required for connected devices.
  - 3. Current Transformers: Connect secondaries to shorting terminal blocks.
  - 4. Potential Transformers: Include primary and secondary fuses with disconnecting means.

### 2.03 OVERCURRENT PROTECTIVE DEVICES

- A. Overload Relays:
  - 1. Provide overload relays and, where applicable, associated current elements/heaters, selected according to actual installed motor nameplate data, in accordance with manufacturer's recommendations and NFPA 70; include consideration for motor service factor and ambient temperature correction, where applicable.
  - 2. Inverse-Time Trip Class Rating: Class 20 unless otherwise indicated or required.
  - 3. Trip-free operation.
  - 4. Visible trip indication.
  - 5. Resettable.
    - a. Employ manual reset unless otherwise indicated.

- b. Do not employ automatic reset with two-wire control.

**END OF SECTION**

**SECTION 263213  
ENGINE GENERATORS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Packaged engine generator system and associated components and accessories:
  - 1. Engine and engine accessory equipment.
  - 2. Alternator (generator).
  - 3. Generator set control system.
  - 4. Generator set enclosure.

**1.02 RELATED REQUIREMENTS**

- A. Section 260526 - Grounding and Bonding for Electrical Systems.
- B. Section 260529 - Hangers and Supports for Electrical Systems.
- C. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- D. Section 263600 - Transfer Switches.

**1.03 REFERENCE STANDARDS**

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- B. NECA/EGSA 404 - Standard for Installing Generator Sets; 2014.
- C. NEMA MG 1 - Motors and Generators; 2024.
- D. NFPA 37 - Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines; 2024, with Amendment.
- E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. NFPA 99 - Health Care Facilities Code; 2024, with Errata.
- G. NFPA 110 - Standard for Emergency and Standby Power Systems; 2025.
- H. UL 2200 - Stationary Engine Generator Assemblies; Current Edition, Including All Revisions.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate compatibility of generator sets to be installed with work provided under other sections or by others.
    - a. Transfer Switches: See Section 263600.
  - 2. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment or other potential obstructions within the spaces dedicated for engine generator system.
  - 3. Coordinate arrangement of equipment with the dimensions and clearance requirements of the actual equipment to be installed.

4. Coordinate the work to provide electrical circuits suitable for the power requirements of the actual auxiliary equipment and accessories to be installed.
5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

#### **1.05 SUBMITTALS**

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product, including ratings, configurations, dimensions, finishes, weights, service condition requirements, and installed features. Include alternator starting capabilities, engine fuel consumption rates, and cooling, combustion air, and exhaust requirements.
- B. Specimen Warranty: Submit sample of manufacturer's warranty.
- C. Manufacturer's factory emissions certification.
- D. Source quality control test reports.
- E. Manufacturer's detailed field testing procedures.
- F. Operation and Maintenance Data: Include detailed information on system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.
  1. Include contact information for entity that will be providing contract maintenance and trouble call-back service.
- G. Executed Warranty: Submit documentation of final executed warranty completed in Owner's name and registered with manufacturer.
- H. Maintenance contracts.
- I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  1. Extra Fuses: One of each type and size.
  2. Extra Filter Elements: One of each type, including fuel, oil and air.

#### **1.06 QUALITY ASSURANCE**

- A. Comply with the following:
  1. NFPA 70 (National Electrical Code).
  2. NFPA 37 (Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines).
- B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store generator sets in accordance with manufacturer's instructions and NECA/EGSA 404.
- B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and

traffic.

- C. Handle carefully in accordance with manufacturer's instructions to avoid damage to generator set components, enclosure, and finish.

## **1.08 FIELD CONDITIONS**

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

## **1.09 WARRANTY**

- A. Provide minimum one year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Packaged Engine Generator Set:
  - 1. Caterpillar Inc: [www.cat.com/#sle](http://www.cat.com/#sle).
  - 2. Cummins Power Generation Inc: [www.cumminspower.com/#sle](http://www.cumminspower.com/#sle).
  - 3. Generac Power Systems: [www.generac.com/industrial/#sle](http://www.generac.com/industrial/#sle).
- B. Source Limitations: Furnish engine generator sets and associated components and accessories produced by single manufacturer and obtained from single supplier.

### **2.02 PACKAGED ENGINE GENERATOR SYSTEM**

- A. Provide new engine generator system consisting of all required equipment, sensors, conduit, boxes, wiring, piping, supports, accessories, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. System Description:
  - 1. Application: Emergency/standby.
  - 2. Configuration: Single packaged engine generator set operated independently (not in parallel).
- D. Packaged Engine Generator Set:
  - 1. Type: Gaseous (spark ignition).
  - 2. Power Rating: 80 kW, standby.
  - 3. Voltage: As indicated on drawings.
  - 4. Main Line Circuit Breaker:
    - a. Type: Thermal magnetic.
    - b. Trip Rating: Select according to generator set rating.
- E. Generator Set General Requirements:
  - 1. Prototype tested in accordance with NFPA 110 for Level 1 systems.
  - 2. Factory-assembled, with components mounted on suitable base.
  - 3. List and label engine generator assembly as complying with UL 2200.

4. Power Factor: Unless otherwise indicated, specified power ratings are at 0.8 power factor for three phase voltages and 1.0 power factor for single phase voltages.
  5. Provide suitable guards to protect personnel from accidental contact with rotating parts, hot piping, and other potential sources of injury.
  6. Main Line Circuit Breakers: Provide factory-installed line side connections with suitable lugs for load side connections.
- F. Service Conditions: Provide engine generator system and associated components suitable for operation under the service conditions at the installed location.
- G. Starting and Load Acceptance Requirements:
1. Cranking Method: Cycle cranking complying with NFPA 110 (15 second crank period, followed by 15 second rest period, with cranking limiter time-out after 3 cycles), unless otherwise required.
  2. Cranking Limiter Time-Out: If generator set fails to start after specified cranking period, indicate overcrank alarm condition and lock-out generator set from further cranking until manually reset.
  3. Start Time: Capable of starting and achieving conditions necessary for load acceptance within 10 seconds (NFPA 110, Type 10).
  4. Maximum Load Step: Supports 100 percent of rated load in one step.
- H. Exhaust Emissions Requirements:
1. Comply with federal (EPA), state, and local regulations applicable at the time of commissioning; include factory emissions certification with submittals.
  2. Do not make modifications affecting generator set factory emissions certification without approval of manufacturer and Engineer. Where such modifications are made, provide field emissions testing as necessary for certification.

### **2.03 ENGINE AND ENGINE ACCESSORY EQUIPMENT**

- A. Provide engine with adequate horsepower to achieve specified power output at rated speed, accounting for alternator efficiency and parasitic loads.
- B. Engine Fuel System - Gaseous (Spark Ignition):
1. Fuel Source: Natural gas.
  2. Engine Fuel Connections: Provide suitable, approved flexible fuel lines for coupling engine to fuel source.
  3. Provide components/features indicated and as necessary for operation and/or required by applicable codes, including but not limited to:
    - a. Carburetor.
    - b. Gas pressure regulators.
    - c. Fuel shutoff control valves.
    - d. Low gas pressure switches.
- C. Engine Starting System:
1. System Type: Electric, with DC solenoid-activated starting motor(s).

2. Battery(s):
    - a. Battery Type: Lead-acid.
    - b. Battery Capacity: Size according to manufacturer's recommendations for achieving starting and load acceptance requirements under worst case ambient temperature; capable of providing cranking through two complete periods of cranking limiter time-outs without recharging.
    - c. Provide battery rack, cables, and connectors suitable for the supplied battery(s); size battery cables according to manufacturer's recommendations for cable length to be installed.
  3. Battery-Charging Alternator: Engine-driven, with integral solid-state voltage regulation.
- D. Engine Speed Control System (Governor):
1. Single Engine Generator Sets (Not Operated in Parallel): Provide electronic isochronous governor for controlling engine speed/alternator frequency.
  2. Frequency Regulation, Electronic Isochronous Governors: No change in frequency from no load to full load; plus/minus 0.25 percent at steady state.
- E. Engine Lubrication System:
1. System Type: Full pressure, with engine-driven, positive displacement lubrication oil pump, replaceable full-flow oil filter(s), and dip-stick for oil level indication. Provide oil cooler where recommended by manufacturer.
- F. Engine Cooling System:
1. System Type: Closed-loop, liquid-cooled, with unit-mounted radiator/fan and engine-driven coolant pump; suitable for providing adequate cooling while operating at full load under worst case ambient temperature.
  2. Fan Guard: Provide suitable guard to protect personnel from accidental contact with fan.
- G. Engine Air Intake and Exhaust System:
1. Air Intake Filtration: Provide engine-mounted, replaceable, dry element filter.
  2. Engine Exhaust Connection: Provide suitable, approved flexible connector for coupling engine to exhaust system.

#### **2.04 ALTERNATOR (GENERATOR)**

- A. Alternator: 4-pole, 1800 rpm (60 Hz output) revolving field, synchronous generator complying with NEMA MG 1; connected to engine with flexible coupling; voltage output configuration as indicated, with reconnectable leads for 3 phase alternators.
- B. Exciter:
1. Exciter Type: Brushless; provide permanent magnet generator (PMG) excitation system; self-excited (shunt) systems are not permitted.
  2. PMG Excitation Short-Circuit Current Support: Capable of sustaining 300 percent of rated output current for 10 seconds.

3. Voltage Regulation (with PMG excitation): Plus/minus 0.5 percent for any constant load from no load to full load.
- C. Temperature Rise: Comply with UL 2200.
- D. Insulation System: NEMA MG 1, Class H; suitable for alternator temperature rise.
- E. Enclosure: NEMA MG 1, drip-proof.
- F. Total Harmonic Distortion: Not greater than five percent.

## 2.05 GENERATOR SET CONTROL SYSTEM

- A. Provide microprocessor-based control system for automatic control, monitoring, and protection of generator set. Include sensors, wiring, and connections necessary for functions/indications specified.
- B. Control Panel:
  1. Control Panel Mounting: Unit-mounted unless otherwise indicated; vibration isolated.
  2. Generator Set Control Functions:
    - a. Automatic Mode: Initiates generator set start/shutdown upon receiving corresponding signal from remote device (e.g. automatic transfer switch).
    - b. Manual Mode: Initiates generator set start/shutdown upon direction from operator.
    - c. Reset Mode: Clears all faults, allowing generator set restart after a shutdown.
    - d. Emergency Stop: Immediately shuts down generator set (without time delay) and prevents automatic restarting until manually reset.
    - e. Cycle Cranking: Programmable crank time, rest time, and number of cycles.
    - f. Time Delay: Programmable for shutdown (engine cooldown) and start (engine warmup).
    - g. Voltage Adjustment: Adjustable through range of plus/minus 5 percent.
  3. Generator Set Status Indications:
    - a. Voltage (Volts AC): Line-to-line, line-to-neutral for each phase.
    - b. Current (Amps): For each phase.
    - c. Frequency (Hz).
    - d. Real power (W/kW).
    - e. Reactive power (VAR/kVAR).
    - f. Apparent power (VA/kVA).
    - g. Power factor.
    - h. Duty Level: Actual load as percentage of rated power.
    - i. Engine speed (RPM).
    - j. Battery voltage (Volts DC).
    - k. Engine oil pressure.
    - l. Engine coolant temperature.
    - m. Engine run time.
    - n. Generator powering load (position signal from transfer switch).

4. Generator Set Protection and Warning/Shutdown Indications:
    - a. Comply with NFPA 110; configurable for NFPA 110 Level 1 or Level 2, or NFPA 99 systems including but not limited to the following protections/indications:
      - 1) Overcrank (shutdown).
      - 2) Low coolant temperature (warning).
      - 3) High coolant temperature (warning).
      - 4) High coolant temperature (shutdown).
      - 5) Low oil pressure (shutdown).
      - 6) Overspeed (shutdown).
      - 7) Low fuel level (warning).
      - 8) Low coolant level (warning/shutdown).
      - 9) Generator control not in automatic mode (warning).
      - 10) High battery voltage (warning).
      - 11) Low cranking voltage (warning).
      - 12) Low battery voltage (warning).
      - 13) Battery charger failure (warning).
    - b. In addition to NFPA 110 requirements, provide the following protections/indications:
      - 1) High AC voltage (shutdown).
      - 2) Low AC voltage (shutdown).
      - 3) High frequency (shutdown).
      - 4) Low frequency (shutdown).
      - 5) Overcurrent (shutdown).
    - c. Provide contacts for local and remote common alarm.
    - d. Provide lamp test function that illuminates all indicator lamps.
  5. Other Control Panel Features:
    - a. Event log.
- C. Remote Annunciator:
1. Remote Annunciator Mounting: Wall-mounted; Provide flush-mounted annunciator for finished areas and surface-mounted annunciator for non-finished areas unless otherwise indicated.
  2. Generator Set Status Indications:
    - a. Generator powering load (via position signal from transfer switch).
    - b. Communication functional.
  3. Generator Set Warning/Shutdown Indications:
    - a. Comply with NFPA 110; configurable for NFPA 110 Level 1 or Level 2, or NFPA 99 systems including but not limited to the following indications:
      - 1) Overcrank (shutdown).
      - 2) Low coolant temperature (warning).
      - 3) High coolant temperature (warning).

- 4) High coolant temperature (shutdown).
  - 5) Low oil pressure (shutdown).
  - 6) Overspeed (shutdown).
  - 7) Low fuel level (warning).
  - 8) Low coolant level (warning/shutdown).
  - 9) Generator control not in automatic mode (warning).
  - 10) High battery voltage (warning).
  - 11) Low cranking voltage (warning).
  - 12) Low battery voltage (warning).
  - 13) Battery charger failure (warning).
- b. Provide audible alarm with silence function.
  - c. Provide lamp test function that illuminates all indicator lamps.

## **2.06 GENERATOR SET ENCLOSURE**

- A. Enclosure Type: Sound attenuating, weather protective.
- B. Enclosure Material: Aluminum.
- C. Hardware Material: Stainless steel.
- D. Color: Manufacturer's standard.
- E. Access Doors: Lockable, with all locks keyed alike.
- F. Openings: Designed to prevent bird/rodent entry.
- G. External Drains: Extend oil and coolant drain lines to exterior of enclosure for maintenance service.
- H. Sound Attenuating Enclosures: Line enclosure with non-hydroscopic, self-extinguishing sound-attenuating material.

## **2.07 SOURCE QUALITY CONTROL**

- A. Perform production tests on generator sets at factory to verify operation and performance characteristics prior to shipment. Include certified test report with submittals.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings and configurations of generator sets and auxiliary equipment are consistent with the indicated requirements.
- C. Verify that rough-ins for field connections are in the proper locations.
- D. Verify that mounting surfaces are ready to receive equipment.
- E. Verify that conditions are satisfactory for installation prior to starting work.

### **3.02 INSTALLATION**

- A. Perform work in accordance with NECA 1 (general workmanship).

- B. Install products in accordance with manufacturer's instructions.
- C. Install generator sets and associated accessories in accordance with NECA/EGSA 404.
- D. Arrange equipment to provide minimum clearances and required maintenance access.
- E. Unless otherwise indicated, mount generator set on properly sized, minimum 6 inch (150 mm) high concrete pad constructed in accordance with Section 033000.
- F. Provide required support and attachment in accordance with Section 260529.
- G. Use manufacturer's recommended oil and coolant, suitable for the worst case ambient temperatures.
- H. Provide engine exhaust piping in accordance with Section 235100, where not factory installed.
  - 1. Include piping expansion joints, piping insulation, thimble, condensation trap/drain, rain cap, hangers/supports, etc. as indicated or as required.
  - 2. Do not exceed manufacturer's maximum back pressure requirements.
- I. Do not insulate piping for engine components restricted by manufacturer.
- J. Provide grounding and bonding in accordance with Section 260526.
- K. Identify system wiring and components in accordance with Section 260553.

### **3.03 FIELD QUALITY CONTROL**

- A. Notify Owner and Architect at least two weeks prior to scheduled inspections and tests.
- B. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.
- C. Provide all equipment, tools, and supplies required to accomplish inspection and testing, including load bank and fuel.
- D. Preliminary inspection and testing to include, at a minimum:
  - 1. Inspect each system component for damage and defects.
  - 2. Verify tightness of mechanical and electrical connections are according to manufacturer's recommended torque settings.
  - 3. Check for proper oil and coolant levels.
- E. Prepare and start system in accordance with manufacturer's instructions.
- F. Provide field emissions testing where necessary for certification.
- G. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

### **3.04 CLEANING**

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

**3.05 CLOSEOUT ACTIVITIES**

- A. Demonstration: Demonstrate proper operation of system to Owner, and correct deficiencies or make adjustments as directed.

**3.06 PROTECTION**

- A. Protect installed engine generator system from subsequent construction operations.

**3.07 MAINTENANCE**

- A. Provide to Owner a proposal as an alternate to the base bid, a separate maintenance contract for the service and maintenance of engine generator system for two years from date of Substantial Completion; Include a complete description of preventive maintenance, systematic examination, adjustment, inspection, and testing, with a detailed schedule.
- B. Maintain an on-site log listing the date and time of each inspection and call-back visit, the condition of the system, nature of the trouble, correction performed, and parts replaced.

**END OF SECTION**

**SECTION 263600**  
**TRANSFER SWITCHES**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Transfer switches for low-voltage (600 V and less) applications and associated accessories:
  - 1. Automatic transfer switches.

**1.02 RELATED REQUIREMENTS**

- A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.
- B. Section 260526 - Grounding and Bonding for Electrical Systems.
- C. Section 260529 - Hangers and Supports for Electrical Systems.
- D. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- E. Section 262816.16 - Enclosed Switches: Safety switches not listed for use as transfer switch equipment.
- F. Section 263213 - Engine Generators: For interface with transfer switches.

**1.03 REFERENCE STANDARDS**

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- C. NEMA ICS 10 Part 1 - Industrial Control and Systems Part 1: Electromechanical AC Transfer Switch Equipment; 2020.
- D. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.
- E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. UL 1008 - Transfer Switch Equipment; Current Edition, Including All Revisions.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate compatibility of transfer switches to be installed with work provided under other sections or by others.
    - a. Engine Generators: See Section 263213.
  - 2. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.
  - 3. Coordinate arrangement of equipment with the dimensions and clearance requirements of the actual equipment to be installed.

4. Coordinate the work with placement of supports, anchors, etc. required for mounting.
5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

#### **1.05 SUBMITTALS**

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product, including ratings, configurations, dimensions, finishes, weights, service condition requirements, and installed features.
- B. Source quality control test reports.
- C. Maintenance contracts.

#### **1.06 QUALITY ASSURANCE**

- A. Comply with the following:
  1. NFPA 70 (National Electrical Code).
- B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store transfer switches in accordance with manufacturer's instructions.
- B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- C. Handle carefully in accordance with manufacturer's instructions to avoid damage to transfer switch components, enclosure, and finish.

#### **1.08 FIELD CONDITIONS**

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

#### **1.09 WARRANTY**

- A. Provide minimum one year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Transfer Switches:
  1. ABB: [www.electrification.us.abb.com/#sle](http://www.electrification.us.abb.com/#sle).
  2. Eaton Corporation: [www.eaton.com/#sle](http://www.eaton.com/#sle).
  3. Generac Power Systems: [www.generac.com/industrial/#sle](http://www.generac.com/industrial/#sle).
  4. Rehlko: [www.powersystems.rehlko.com/#sle](http://www.powersystems.rehlko.com/#sle).
  5. Schneider Electric; ASCO Power Technologies: [www.ascopower.com/#sle](http://www.ascopower.com/#sle).

6. Thomson Power Systems: [www.thomsonps.com/#sle](http://www.thomsonps.com/#sle).

## 2.02 TRANSFER SWITCHES

- A. Provide complete power transfer system consisting of all required equipment, conduit, boxes, wiring, supports, accessories, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Applications:
  1. Utilize open transition transfer unless otherwise indicated or required.
  2. Neutral Switching (Single Phase, Three Wire and Three Phase, Four Wire Systems):
    - a. Unless otherwise indicated or required, provide neutral switching:
      - 1) For systems with ground fault protection.
      - 2) Where the alternate/emergency source is a separately derived system.
- D. Construction Type: Only "breaker type" (enclosed contact) transfer switches are acceptable. Do not use "contactor type" (open contact) transfer switches.
- E. Basis of Design - Automatic Transfer Switch: Schneider Electric; ASCO 300 Series: [www.ascopower.com/#sle](http://www.ascopower.com/#sle).
  1. Non-Service-Entrance Switch:
    - a. Frame: 30 A to 230 A; open transition only.
    - b. Transition Configuration: Open-transition.
    - c. Neutral Configuration: Switched neutral.
    - d. Phase Poles: As indicated on drawings.
    - e. Ampere Rating: As indicated on drawings.
    - f. Voltage: As indicated on drawings.
    - g. Enclosure: As required for installed location.
  2. Provide the following accessories:
    - a. Connectivity module for remote monitoring and control and bundle including engine exerciser, event log, additional monitoring.
    - b. Audible alarm with silence.
- F. Comply with NEMA ICS 10 Part 1, and list and label as complying with UL 1008 for the classification of the intended application (e.g. emergency, optional standby).
- G. Do not use double throw safety switches or other equipment not specifically designed for power transfer applications and listed as transfer switch equipment.
- H. Load Classification: Classified for total system load (any combination of motor, electric discharge lamp, resistive, and tungsten lamp loads with tungsten lamp loads not exceeding 30 percent of the continuous current rating) unless otherwise indicated or required.
- I. Switching Methods:
  1. Open Transition:

- a. Provide break-before-make transfer without a neutral position that is not connected to either source, and with interlocks to prevent simultaneous connection of the load to both sources.
  2. Neutral Switching: Use simultaneously switched neutral (break-before-make) method. Overlapping neutral method is not acceptable.
  3. Obtain control power for transfer operation from line side of source to which the load is to be transferred.
- J. Service Conditions: Provide transfer switches suitable for continuous operation at indicated ratings under the service conditions at the installed location.
- K. Enclosures:
1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
  2. Finish: Manufacturer's standard unless otherwise indicated.
- L. Short Circuit Current Rating:
1. Withstand and Closing Rating: Provide transfer switches, when protected by the supply side overcurrent protective devices to be installed, with listed withstand and closing rating not less than the available fault current at the installed location as indicated on the drawings.
- M. Automatic Transfer Switches:
1. Description: Transfer switches with automatically initiated transfer between sources; electrically operated and mechanically held.
  2. Control Functions:
    - a. Automatic mode.
    - b. Test Mode: Simulates failure of primary/normal source.
    - c. Voltage and Frequency Sensing:
      - 1) Undervoltage sensing for each phase of primary/normal source; adjustable dropout/pickup settings.
      - 2) Undervoltage sensing for alternate/emergency source; adjustable dropout/pickup settings.
      - 3) Underfrequency sensing for alternate/emergency source; adjustable dropout/pickup settings.
    - d. Outputs:
      - 1) Contacts for engine start/shutdown (except where direct generator communication interface is provided).
      - 2) Auxiliary contacts; one set(s) for each switch position.
    - e. Adjustable Time Delays:
      - 1) Engine generator start time delay; delays engine start signal to override momentary primary/normal source failures.
      - 2) Transfer to alternate/emergency source time delay.
      - 3) Retransfer to primary/normal source time delay.

- 4) Engine generator cooldown time delay; delays engine shutdown following retransfer to primary/normal source to permit generator to run unloaded for cooldown period.
  - f. In-Phase Monitor (Open Transition Transfer Switches): Monitors phase angle difference between sources for initiating in-phase transfer.
  - g. Engine Exerciser: Provides programmable scheduled exercising of engine generator selectable with or without transfer to load; provides memory retention during power outage.
3. Status Indications:
    - a. Connected to alternate/emergency source.
    - b. Connected to primary/normal source.
    - c. Alternate/emergency source available.
  4. Automatic Sequence of Operations:
    - a. Upon failure of primary/normal source for a programmable time period (engine generator start time delay), initiate starting of engine generator where applicable.
    - b. When alternate/emergency source is available, transfer load to alternate/emergency source after programmable time delay.
    - c. When primary/normal source has been restored, retransfer to primary/normal source after a programmable time delay. Bypass time delay if alternate/emergency source fails and primary/normal source is available.
    - d. Where applicable, initiate shutdown of engine generator after programmable engine cooldown time delay.

### **2.03 SOURCE QUALITY CONTROL**

- A. Perform production tests on transfer switches at factory to verify operation and performance characteristics prior to shipment. Include certified test report with submittals.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings and configurations of transfer switches are consistent with the indicated requirements.
- C. Verify that rough-ins for field connections are in the proper locations.
- D. Verify that mounting surfaces are ready to receive transfer switches.
- E. Verify that conditions are satisfactory for installation prior to starting work.

### **3.02 INSTALLATION**

- A. Perform work in accordance with NECA 1 (general workmanship).
- B. Install products in accordance with manufacturer's instructions.
- C. Arrange equipment to provide minimum clearances and required maintenance access.

- D. Provide required support and attachment in accordance with Section 260529.
- E. Install transfer switches plumb and level.
- F. Unless otherwise indicated, mount floor-mounted transfer switches on properly sized 3 inch (80 mm) high concrete pad constructed in accordance with Section 033000.
- G. Provide grounding and bonding in accordance with Section 260526.
- H. Identify transfer switches and associated system wiring in accordance with Section 260553.

### **3.03 FIELD QUALITY CONTROL**

- A. Prepare and start system in accordance with manufacturer's instructions.
- B. Automatic Transfer Switches:
  - 1. Inspect and test in accordance with NETA ATS, except Section 4.
  - 2. Perform inspections and tests listed in NETA ATS, Section 7.22.3. The insulation-resistance tests listed as optional are not required.
- C. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

### **3.04 CLEANING**

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

### **3.05 CLOSEOUT ACTIVITIES**

- A. Demonstration: Demonstrate proper operation of transfer switches to Owner, and correct deficiencies or make adjustments as directed.

### **3.06 PROTECTION**

- A. Protect installed transfer switches from subsequent construction operations.

### **3.07 MAINTENANCE**

- A. Provide to Owner a proposal as an alternate to the base bid, a separate maintenance contract for the service and maintenance of transfer switches for two years from date of Substantial Completion; Include a complete description of preventive maintenance, systematic examination, adjustment, inspection, and testing, with a detailed schedule.
- B. Maintain an on-site log listing the date and time of each inspection and call-back visit, the condition of the system, nature of the trouble, correction performed, and parts replaced.

**END OF SECTION**

**SECTION 264300**  
**SURGE PROTECTIVE DEVICES**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Surge protective devices for service entrance locations.

**1.02 RELATED REQUIREMENTS**

- A. Section 260526 - Grounding and Bonding for Electrical Systems.
- B. Section 262416 - Panelboards.

**1.03 ABBREVIATIONS AND ACRONYMS**

- A. SPD: Surge Protective Device.

**1.04 REFERENCE STANDARDS**

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- C. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.
- D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. UL 1449 - Standard for Surge Protective Devices; Current Edition, Including All Revisions.

**1.05 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination: Coordinate size and location of overcurrent device compatible with the actual surge protective device and location to be installed. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to ordering equipment.

**1.06 SUBMITTALS**

- A. Product Data: Include detailed component information, voltage, surge current ratings, repetitive surge current capacity, voltage protection rating (VPR) for all protection modes, maximum continuous operating voltage (MCOV), nominal discharge current (I-n), short circuit current rating (SCCR), connection means including any required external overcurrent protection, enclosure ratings, outline and support point dimensions, weight, service condition requirements, and installed features.

**1.07 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.

**1.08 DELIVERY, STORAGE, AND PROTECTION**

- A. Store in a clean, dry space in accordance with manufacturer's written instructions.

## 1.09 FIELD CONDITIONS

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

## 1.10 WARRANTY

- A. Manufacturer's Warranty: Provide minimum five year warranty covering repair or replacement of surge protective devices showing evidence of failure due to defective materials or workmanship.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Field-Installed, Externally Mounted Surge Protective Devices:
  - 1. ABB: [www.electrification.us.abb.com/#sle](http://www.electrification.us.abb.com/#sle).
  - 2. Intermatic, Inc: [www.intermatic.com/#sle](http://www.intermatic.com/#sle).
  - 3. nVent ERICO: [www.nvent.com/#sle](http://www.nvent.com/#sle).
  - 4. Schneider Electric: [www.se.com/#sle](http://www.se.com/#sle).
  - 5. Surge Suppression, LLC (SSI): [www.surgesuppression.com/#sle](http://www.surgesuppression.com/#sle).
- B. Factory-installed, Internally Mounted Surge Protective Devices:
  - 1. Same as manufacturer of equipment containing surge protective device, to provide complete listed assembly including SPD.

### 2.02 SURGE PROTECTIVE DEVICES - GENERAL REQUIREMENTS

- A. Description: Factory-assembled surge protective devices (SPDs) for 60 Hz service; listed, classified, and labeled as suitable for the purpose intended; system voltage as indicated on the drawings.
- B. Unless otherwise indicated, provide field-installed, externally-mounted or factory-installed, internally-mounted SPDs.
- C. List and label as complying with UL 1449, Type 1 when connected on line side of service disconnect overcurrent device and Type 1 or 2 when connected on load side of service disconnect overcurrent device.
- D. Protected Modes:
- E. UL 1449 Voltage Protection Ratings (VPRs):
  - 1. Equivalent to basis of design.
- F. UL 1449 Maximum Continuous Operating Voltage (MCOV): Not less than 115% of nominal system voltage.
- G. Enclosure Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
  - 1. Indoor clean, dry locations: Type 1.
- H. Mounting for Field-installed, Externally Mounted SPDs: Unless otherwise indicated, as specified for the following locations:

1. Provide surface-mounted SPD where mounted in non-public areas or adjacent to surface-mounted equipment.
- I. Equipment Containing Factory-installed, Internally Mounted SPDs: Listed and labeled as a complete assembly including SPD.
  1. Panelboards: See Section 262416.

### **2.03 SURGE PROTECTIVE DEVICES FOR SERVICE ENTRANCE LOCATIONS**

- A. Surge Protective Device:
  1. Protection Circuits: Field-replaceable modular or non-modular.
  2. Surge Current Rating: Not less than 120 kA per mode/240 kA per phase.
  3. UL 1449 Nominal Discharge Current (I-n): 20 kA.
  4. UL 1449 Short Circuit Current Rating (SCCR): Not less than the available fault current at the installed location as indicated on the drawings.
  5. Diagnostics:
    - a. Protection Status Monitoring: Provide indicator lights to report the protection for each phase.
    - b. Alarm Notification: Provide indicator light and audible alarm to report alarm condition. Provide button to manually silence audible alarm.
- B. Basis of Design - Surge Protective Device: Surge Suppression, LLC (SSI); Advantage Series; Model SSLB (100 kA/phase, Type 2, I-n = 20 kA); [www.surgesuppression.com/#sle](http://www.surgesuppression.com/#sle).
  1. Voltage: As indicated on drawings.
  2. Features: Discrete "all-mode" protection (10 modes for 3-phase wye circuits); component-level thermal fusing; internal circuit board-mounted overcurrent fusing; 200 kAIC SCCR; 25 year warranty.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that the service voltage and configuration marked on the SPD are consistent with the service voltage and configuration at the location to be installed.
- C. Verify system grounding and bonding is in accordance with Section 260526, including bonding of neutral and ground for service entrance and separately derived systems where applicable. Do not energize SPD until deficiencies have been corrected.
- D. Verify that conditions are satisfactory for installation prior to starting work.

### **3.02 INSTALLATION**

- A. Perform work in accordance with NECA 1 (general workmanship).
- B. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- C. Do not energize SPD until bonding of neutral and ground for service entrance and separately derived systems is complete in accordance with Section 260526 where

applicable. Replace SPDs damaged by improper or missing neutral-ground bond.

### **3.03 FIELD QUALITY CONTROL**

- A. Inspect and test in accordance with NETA ATS, except Section 4.
- B. Perform inspections and tests listed in NETA ATS Section 7.19.1.

### **3.04 CLEANING**

- A. Repair scratched or marred exterior surfaces to match original factory finish.

**END OF SECTION**

**SECTION 265100  
INTERIOR LIGHTING**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Interior luminaires.
- B. Emergency lighting units.
- C. Exit signs.
- D. Ballasts and drivers.

**1.02 RELATED REQUIREMENTS**

- A. Section 260529 - Hangers and Supports for Electrical Systems.
- B. Section 260533.16 - Boxes for Electrical Systems.
- C. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- D. Section 260923 - Lighting Control Devices.
- E. Section 262726 - Wiring Devices: Manual wall switches and wall dimmers.
- F. Section 265600 - Exterior Lighting.

**1.03 REFERENCE STANDARDS**

- A. IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products; 2024.
- B. IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources; 2021.
- C. NECA/IESNA 500 - Standard for Installing Indoor Lighting Systems; 2006.
- D. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; 2006.
- E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.
- H. UL 1598 - Luminaires; Current Edition, Including All Revisions.
- I. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports,

anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.

2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
3. Coordinate the placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility installed under other sections or by others.
4. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

#### **1.05 SUBMITTALS**

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.
  1. LED Luminaires:
    - a. Include estimated useful life, calculated based on IES LM-80 test data.

#### **1.06 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.

#### **1.07 DELIVERY, STORAGE, AND PROTECTION**

- A. Receive, handle, and store products according to manufacturer's written instructions.
- B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

#### **1.08 FIELD CONDITIONS**

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

#### **1.09 WARRANTY**

- A. Provide 3-year manufacturer warranty for LED luminaires, including drivers.

### **PART 2 PRODUCTS**

#### **2.01 LUMINAIRE TYPES**

- A. Furnish products as indicated in luminaire schedule included on the drawings.

#### **2.02 LUMINAIRES**

- A. Manufacturers:
  1. Acuity Brands, Inc: [www.acuitybrands.com/#sle](http://www.acuitybrands.com/#sle).
  2. As listed in the Lighting Fixture Schedule.
  3. Cooper Lighting, a division of Cooper Industries:  
[www.cooperindustries.com/#sle](http://www.cooperindustries.com/#sle).

- B. Provide products that comply with requirements of NFPA 70.
- C. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- D. Provide products listed, classified, and labeled as suitable for the purpose intended.
- E. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
- F. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.
- G. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.
- H. LED Luminaires:
  - 1. Components: UL 8750 recognized or listed as applicable.
  - 2. Tested in accordance with IES LM-79 and IES LM-80.
  - 3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

### 2.03 EMERGENCY LIGHTING UNITS

- A. Manufacturers:
  - 1. Acuity Brands, Inc; \_\_\_\_\_: [www.acuitybrands.com/#sle](http://www.acuitybrands.com/#sle).
  - 2. Cooper Lighting, a division of Cooper Industries:  
[www.cooperindustries.com/#sle](http://www.cooperindustries.com/#sle).
- B. Description: Emergency lighting units complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.
- C. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.
- D. Battery:
  - 1. Size battery to supply all connected lamps, including emergency remote heads where indicated.
- E. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.
- F. Provide low-voltage disconnect to prevent battery damage from deep discharge.
- G. Self-Diagnostics: Provide units that self-monitor functionality and automatically perform testing required by NFPA 101 where indicated; provide indicator light(s) to report test and diagnostic status.

## 2.04 EXIT SIGNS

- A. Description: Exit signs complying with NFPA 101 and applicable state and local codes, and listed and labeled as complying with UL 924.
  - 1. Number of Faces: Single- or double-face as indicated or as required for installed location.
  - 2. Directional Arrows: As indicated or as required for installed location.
- B. Powered Exit Signs: Internally illuminated with LEDs unless otherwise indicated.
  - 1. Manufacturers:
    - a. Acuity Brands, Inc; \_\_\_\_\_: [www.acuitybrands.com/#sle](http://www.acuitybrands.com/#sle).
    - b. Cooper Lighting, a division of Cooper Industries:  
[www.cooperindustries.com/#sle](http://www.cooperindustries.com/#sle).

## 2.05 BALLASTS AND DRIVERS

- A. Manufacturers:
  - 1. Alloy LED: [www.alloyled.com/#sle](http://www.alloyled.com/#sle).
  - 2. General Electric Company/GE Lighting: [www.gelighting.com/#sle](http://www.gelighting.com/#sle).
  - 3. Lutron Electronics Company, Inc: [www.lutron.com/#sle](http://www.lutron.com/#sle).
  - 4. OSRAM Sylvania, Inc: [www.osram.us/ds/#sle](http://www.osram.us/ds/#sle).
  - 5. Philips Lighting North America Corporation: [www.usa.lighting.philips.com/#sle](http://www.usa.lighting.philips.com/#sle).
- B. Ballasts/Drivers - General Requirements:
  - 1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
  - 2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.
- C. Dimmable LED Drivers:
  - 1. Dimming Range: Continuous dimming from 100 percent to five percent relative light output unless dimming capability to lower level is indicated, without flicker.
  - 2. Control Compatibility: Fully compatible with the dimming controls to be installed.
    - a. Wall Dimmers: See Section 262726.
  - 3. Product(s):
    - a. Lutron Hi-Lume Premier 0.1% Constant Voltage (L3D0-Series): 3-wire and digital control; 0.1 percent dimming with Soft-On and Fade-to-Black low end performance; [www.lutron.com/#sle](http://www.lutron.com/#sle).
    - b. Lutron Hi-Lume 1% (L3D-Series): 3-wire and digital control; one percent dimming; [www.lutron.com/#sle](http://www.lutron.com/#sle).
    - c. Lutron Hi-lume 1% Soft-on Fade-to-Black (LDE1-Series): Digital control; one percent dimming with Soft-On and Fade-to-Black low end performance; [www.lutron.com/#sle](http://www.lutron.com/#sle).

## 2.06 ACCESSORIES

- A. Stems for Suspended Luminaires: Steel tubing, factory finished to match luminaire or field-painted as directed.

- B. Provide accessory plaster frames for luminaires recessed in plaster ceilings.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.
- C. Verify that suitable support frames are installed where required.
- D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.
- E. Verify that conditions are satisfactory for installation prior to starting work.

#### **3.02 PREPARATION**

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

#### **3.03 INSTALLATION**

- A. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of luminaires provided under this section.
- B. Install products in accordance with manufacturer's instructions.
- C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).
- D. Provide required support and attachment in accordance with Section 260529.
- E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
- F. Suspended Ceiling Mounted Luminaires:
  - 1. Do not use ceiling tiles to bear weight of luminaires.
  - 2. Do not use ceiling support system to bear weight of luminaires unless ceiling support system is certified as suitable to do so.
  - 3. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.
  - 4. See appropriate Division 9 section where suspended grid ceiling is specified for additional requirements.
- G. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.
- H. Install accessories furnished with each luminaire.
- I. Bond products and metal accessories to branch circuit equipment grounding conductor.
- J. Emergency Lighting Units:

1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.

K. Exit Signs:

1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.

### **3.04 FIELD QUALITY CONTROL**

- A. Inspect each product for damage and defects.
- B. Operate each luminaire after installation and connection to verify proper operation.
- C. Test self-powered exit signs, emergency lighting units, and fluorescent emergency power supply units to verify proper operation upon loss of normal power supply.
- D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

### **3.05 ADJUSTING**

- A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.
- B. Aim and position adjustable emergency lighting unit lamps to achieve optimum illumination of egress path as required or as directed by Architect or authority having jurisdiction.
- C. Exit Signs with Field-Selectable Directional Arrows: Set as indicated or as required to properly designate egress path as directed by Architect or authority having jurisdiction.

### **3.06 CLEANING**

- A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

### **3.07 CLOSEOUT ACTIVITIES**

- A. Demonstration: Demonstrate proper operation of luminaires to Architect, and correct deficiencies or make adjustments as directed.

### **3.08 PROTECTION**

- A. Protect installed luminaires from subsequent construction operations.

**END OF SECTION**

**SECTION 265600  
EXTERIOR LIGHTING**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Exterior luminaires.
- B. Ballasts.

**1.02 RELATED REQUIREMENTS**

- A. Section 260526 - Grounding and Bonding for Electrical Systems.
- B. Section 260529 - Hangers and Supports for Electrical Systems.
- C. Section 260533.16 - Boxes for Electrical Systems.
- D. Section 260923 - Lighting Control Devices.
- E. Section 265100 - Interior Lighting.

**1.03 REFERENCE STANDARDS**

- A. IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products; 2024.
- B. IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources; 2021.
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- D. NECA/IESNA 501 - Standard for Installing Exterior Lighting Systems; 2000 (Reaffirmed 2006).
- E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. UL 1598 - Luminaires; Current Edition, Including All Revisions.
- G. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

**1.05 SUBMITTALS**

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.
  - 1. LED Luminaires:

- a. Include estimated useful life, calculated based on IES LM-80 test data.

#### **1.06 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, handle, and store products according to NECA/IESNA 501 and manufacturer's written instructions.
- B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

#### **1.08 WARRANTY**

- A. Provide 2-year manufacturer warranty for all LED luminaires, including drivers.

### **PART 2 PRODUCTS**

#### **2.01 LUMINAIRE TYPES**

- A. Furnish products as indicated in luminaire schedule included on the drawings.

#### **2.02 LUMINAIRES**

- A. Manufacturers:
  - 1. Acuity Brands, Inc: [www.acuitybrands.com/#sle](http://www.acuitybrands.com/#sle).
  - 2. Cooper Lighting, a division of Cooper Industries: [www.cooperindustries.com/#sle](http://www.cooperindustries.com/#sle).
- B. Provide products that comply with requirements of NFPA 70.
- C. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- D. Provide products listed, classified, and labeled as suitable for the purpose intended.
- E. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
- F. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.
- G. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.
- H. Provide luminaires listed and labeled as suitable for wet locations unless otherwise indicated.
- I. LED Luminaires:
  - 1. Components: UL 8750 recognized or listed as applicable.
  - 2. Tested in accordance with IES LM-79 and IES LM-80.
  - 3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

## 2.03 BALLASTS AND DRIVERS

- A. Manufacturers:
  - 1. Where a specific manufacturer or model is indicated elsewhere in the luminaire schedule or on the drawings, substitutions are not permitted unless explicitly indicated.
- B. Ballasts/Drivers - General Requirements:
  - 1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
  - 2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.
- C. Verify that suitable support frames are installed where required.
- D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.
- E. Verify that conditions are satisfactory for installation prior to starting work.

### 3.02 INSTALLATION

- A. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of luminaires provided under this section.
- B. Install products in accordance with manufacturer's instructions.
- C. Install luminaires in accordance with NECA/IESNA 501.
- D. Provide required support and attachment in accordance with Section 260529.
- E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
- F. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.
- G. Install accessories furnished with each luminaire.
- H. Bond products and metal accessories to branch circuit equipment grounding conductor.
- I. Install lamps in each luminaire.

### 3.03 FIELD QUALITY CONTROL

- A. Inspect each product for damage and defects.
- B. Operate each luminaire after installation and connection to verify proper operation.

- C. Correct wiring deficiencies and repair or replace damaged or defective products.  
Repair or replace excessively noisy ballasts as determined by Architect.

#### **3.04 ADJUSTING**

- A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.

#### **3.05 CLEANING**

- A. Clean surfaces according to NECA/IESNA 501 and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

#### **3.06 CLOSEOUT ACTIVITIES**

- A. Demonstration: Demonstrate proper operation of luminaires to Architect, and correct deficiencies or make adjustments as directed.

#### **3.07 PROTECTION**

- A. Protect installed luminaires from subsequent construction operations.

**END OF SECTION**

**SECTION 270533.13  
CONDUIT FOR COMMUNICATIONS SYSTEMS**

**PART 2 PRODUCTS**

**1.01 CONDUIT - GENERAL REQUIREMENTS**

- A. Comply with NFPA 70 and TIA-569.
- B. Provide conduit, fittings, supports, and accessories required for complete communications pathway.
- C. Provide products listed, classified, and labeled as suitable for purpose intended.
- D. Where conduit size is not indicated, size to comply with NFPA 70, TIA-569, and BICSI TDMM, but not less than applicable minimum size requirements specified. Where specified standards differ, comply with most stringent.

**END OF SECTION**

**SECTION 271000  
STRUCTURED CABLING**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Communications system design requirements.
- B. Communications pathways.
- C. Copper cable and terminations.
- D. Fiber optic cable and interconnecting devices.
- E. Communications equipment room fittings.
- F. Communications outlets.
- G. Communications grounding and bonding.
- H. Communications identification.

**1.02 RELATED REQUIREMENTS**

- A. Section 260526 - Grounding and Bonding for Electrical Systems.
- B. Section 260533.16 - Boxes for Electrical Systems.
- C. Section 260553 - Identification for Electrical Systems: Identification products.
- D. Section 262726 - Wiring Devices.
- E. Section 270529 - Hangers and Supports for Communications Systems.
- F. Section 270533.13 - Conduit for Communications Systems.

**1.03 REFERENCE STANDARDS**

- A. BICSI N1 - Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure, 1st Edition; 2019.
- B. EIA/ECA-310 - Cabinets, Racks, Panels, and Associated Equipment; 2005e.
- C. ICEA S-83-596 - Indoor Optical Fiber Cable; 2021.
- D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. TIA-455-21 - FOTP-21 - Mating Durability of Fiber Optic Interconnecting Devices; 1988a (Reaffirmed 2012).
- F. TIA-492AAAC - Detail Specification for 850-nm Laser-Optimized, 50-um Core Diameter/125-um Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers; 2009b.
- G. TIA-568 (SET) - Commercial Building Telecommunications Cabling Standard Set; 2024.
- H. TIA-568.2 - Balanced Twisted-Pair Telecommunications Cabling and Components Standards; 2018d, with Addenda (2020).
- I. TIA-568.3 - Optical Fiber Cabling and Components Standard; 2022e.

- J. TIA-569 - Telecommunications Pathways and Spaces; 2019e, with Addendum (2022).
- K. TIA-570 - Residential Telecommunications Infrastructure Standard; 2018d.
- L. TIA-598 - Optical Fiber Cable Color Coding; 2014d, with Addendum (2018).
- M. TIA-606 - Administration Standard for Telecommunications Infrastructure; 2021d.
- N. TIA-607 - Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises; 2019d, with Addendum (2021).
- O. UL 444 - Communications Cables; Current Edition, Including All Revisions.
- P. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers; Current Edition, Including All Revisions.
- Q. UL 1651 - Fiber Optic Cable; Current Edition, Including All Revisions.
- R. UL 1863 - Communications-Circuit Accessories; Current Edition, Including All Revisions.
- S. UL 2024 - Standard for Cable Routing Assemblies and Communications Raceways; Current Edition, Including All Revisions.

#### **1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate requirements for service entrance and entrance facilities with Communications Service Provider.
  - 2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for communications equipment.
  - 3. Coordinate arrangement of communications equipment with the dimensions and clearance requirements of the actual equipment to be installed.
  - 4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

#### **1.05 SUBMITTALS**

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.
- B. Evidence of qualifications for installer.
- C. Field Test Reports.

#### **1.06 QUALITY ASSURANCE**

- A. Installer Qualifications: A company having at least 3 years experience in the installation and testing of the type of system specified, and:
  - 1. Employing a BICSI Registered Communications Distribution Designer (RCDD).
  - 2. Supervisors and installers factory certified by manufacturers of products to be installed.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

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

- B. Keep stored products clean and dry.

## 1.08 WARRANTY

- A. Correct defective Work within a 2 year period after Date of Substantial Completion.

## PART 2 PRODUCTS

### 2.01 SYSTEM DESIGN

- A. Provide a complete permanent system of cabling and pathways for voice and data communications, including cables, conduits and wireways, pull wires, support structures, enclosures and cabinets, and outlets.
  - 1. Comply with TIA-570 (residential standard).
  - 2. Comply with Communications Service Provider requirements.
  - 3. Provide fixed cables and pathways that comply with NFPA 70 and TIA-607 and are UL listed or third party independent testing laboratory certified.
  - 4. Provide connection devices that are rated for operation under conditions of 32 to 140 degrees F (0 to 60 degrees C) at relative humidity of 0 to 95 percent, noncondensing.
  - 5. In this project, the term plenum is defined as return air spaces above ceilings, inside ducts, under raised floors, and other air-handling spaces.
- B. System Description:
  - 1. Building Entrance Cable: By others.
  - 2. Backbones - Within Building: Copper, 4 -pair.
  - 3. Offices and Work Areas: Provide one voice outlet and one data outlet in each work area.
- C. Main Distribution Frame (MDF): Centrally located support structure for terminating horizontal cables that extend to telecommunications outlets, functioning as point of presence to external service provider.
  - 1. Locate main distribution frame as indicated on the drawings.
- D. Intermediate Distribution Frames (IDF): Support structures for terminating horizontal cables that extend to telecommunications outlets.
  - 1. Locate intermediate distribution frames as indicated on the drawings.
- E. Backbone Cabling: Cabling, pathways, and terminal hardware connecting intermediate distribution frames (IDF's) with main distribution frame (MDF), wired in star topology with main distribution frame at center hub of star.
- F. Cabling to Outlets: Specified horizontal cabling, wired in star topology to distribution frame located at center hub of star; also referred to as "links".

### 2.02 PATHWAYS

- A. Overhead Service Entrance: Weatherhead or service entrance fitting located on outside of building with galvanized rigid steel or intermediate metallic conduit running to entrance facility.

B. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

1. Products:

- a. HoldRite, a brand of Reliance Worldwide Corporation; HydroFlame Pro Series/HydroFlame Custom Built: [www.holdrite.com/#sle](http://www.holdrite.com/#sle).

### 2.03 COPPER CABLE AND TERMINATIONS

A. Manufacturers:

1. Belden: [www.belden.com/#sle](http://www.belden.com/#sle).
2. CommScope: [www.commscope.com/#sle](http://www.commscope.com/#sle).
3. General Cable Technologies Corporation: [www.generalcable.com/#sle](http://www.generalcable.com/#sle).
4. Siemon Company: [www.siemon.com/#sle](http://www.siemon.com/#sle).

B. Copper Horizontal Cable:

1. Description: 100 ohm, balanced twisted pair cable complying with TIA-568.2 and listed and labeled as complying with UL 444.
2. Cable Type - Voice and Data: TIA-568.2 Category 6 UTP (unshielded twisted pair); 23 AWG.
3. Cable Capacity: 4-pair.
4. Cable Applications: Use listed NFPA 70 Type CMP plenum cable unless otherwise indicated.
5. Cable Jacket Color - Voice and Data Cable: Blue.
6. Product(s):
  - a. Belden; REVConnect 10GXW Category 6A Enhanced UTP Cable; 10GXW12 (riser)/10GXW13 (plenum): [www.belden.com/#sle](http://www.belden.com/#sle).
  - b. Belden; REVConnect 10GXS Category 6A Premium UTP Cable; 10GXS12 (riser)/10GXS13 (plenum): [www.belden.com/#sle](http://www.belden.com/#sle).
  - c. Belden; DataConnect Category 6A UTP Cable; DAUR (riser)/DAUP (plenum): [www.belden.com/#sle](http://www.belden.com/#sle).
  - d. Belden; REVConnect 2400 Series Category 6 Enhanced UTP Cable; 2412 (riser)/2413 (plenum): [www.belden.com/#sle](http://www.belden.com/#sle).
  - e. Belden; DataConnect Category 6 UTP Cable; D6UR (riser)/D6UP (plenum): [www.belden.com/#sle](http://www.belden.com/#sle).
  - f. CommScope; SYSTIMAX Twisted Pair Cables; GigaSPEED XL Category 6 U/UTP Cable: [www.commscope.com/#sle](http://www.commscope.com/#sle).
  - g. CommScope; Uniprise Twisted Pair Cables; CS34 Series Category 6 U/UTP Cable: [www.commscope.com/#sle](http://www.commscope.com/#sle).
  - h. General Cable Technologies Corporation; GenSPEED Cables: [www.generalcable.com/#sle](http://www.generalcable.com/#sle).

C. Copper Cable Terminations: Insulation displacement connection (IDC) type using appropriate tool; use screw connections only where specifically indicated.

- D. Jacks and Connectors: Modular RJ-45, non-keyed, terminated with 110-style insulation displacement connectors (IDC); high impact thermoplastic housing; suitable for and complying with same standard as specified horizontal cable; UL 1863 listed.
1. Performance: 500 mating cycles.
  2. Voice and Data Jacks: 8-position modular jack, color-coded for both T568A and T568B wiring configurations.
  3. Product(s):
    - a. Belden; REVConnect 10GX Category 6A Modular Jack: [www.belden.com/#sle](http://www.belden.com/#sle).
    - b. Belden; KeyConnect 10GX Category 6A Modular Jack: [www.belden.com/#sle](http://www.belden.com/#sle).
    - c. Belden; DataConnect Category 6A Modular Jack: [www.belden.com/#sle](http://www.belden.com/#sle).
    - d. Belden; REVConnect Category 6+ Modular Jack: [www.belden.com/#sle](http://www.belden.com/#sle).
    - e. Belden; DataConnect Category 6 Modular Jack: [www.belden.com/#sle](http://www.belden.com/#sle).
    - f. CommScope; SYSTIMAX RJ45 Jacks; MGS400 Series Category 6 U/UTP Modular Jacks: [www.commscope.com/#sle](http://www.commscope.com/#sle).
    - g. CommScope; Uniprise RJ45 Jacks; UNJ600 Series Category 6 U/UTP Modular Jacks: [www.commscope.com/#sle](http://www.commscope.com/#sle).

#### 2.04 FIBER OPTIC CABLE AND INTERCONNECTING DEVICES

- A. Manufacturers:
1. Belden: [www.belden.com/#sle](http://www.belden.com/#sle).
  2. CommScope: [www.commscope.com/#sle](http://www.commscope.com/#sle).
  3. General Cable Technologies Corporation: [www.generalcable.com/#sle](http://www.generalcable.com/#sle).
  4. Siemon Company: [www.siemon.com/#sle](http://www.siemon.com/#sle).
- B. Fiber Optic Backbone Cable:
1. Description: Tight buffered, non-conductive fiber optic cable complying with TIA-568.3, TIA-598, ICEA S-83-596 and listed as complying with UL 444 and UL 1651.
  2. Cable Type: Multimode, laser-optimized 50/125 um (OM3) complying with TIA-492AAAC.
  3. Cable Capacity: Quantity of fibers as indicated on drawings.
  4. Cable Applications:
- C. Fiber Optic Horizontal Cable:
1. Description: Tight buffered, non-conductive fiber optic cable complying with TIA-568.3, ICEA S-83-596 and listed as complying with UL 444 and UL 1651.
  2. Cable Type: Multimode, laser-optimized 50/125 um (OM3) complying with TIA-492AAAC.
  3. Cable Capacity: 2-fiber.
  4. Cable Applications: Use listed NFPA 70 Type OFNP plenum cable unless otherwise indicated.

**D. Fiber Optic Interconnecting Devices:**

1. Connector Type: Type LC.
2. Connector Performance: 500 mating cycles, when tested in accordance with TIA-455-21.
3. Maximum Attenuation/Insertion Loss: 0.3 dB.
4. Product(s):
  - a. Belden; FiberExpress FX Fusion Splice-On Connectors:  
[www.belden.com/#sle](http://www.belden.com/#sle).
  - b. Belden; FiberExpress FX Brilliance Universal Connectors:  
[www.belden.com/#sle](http://www.belden.com/#sle).
  - c. CommScope Fiber Optic Connectors; QWIK II-LC Fiber Connectors:  
[www.commscope.com/#sle](http://www.commscope.com/#sle).

**2.05 COMMUNICATIONS EQUIPMENT ROOM FITTINGS****A. Copper Cross-Connection Equipment:**

1. Manufacturers:
  - a. Belden: [www.belden.com/#sle](http://www.belden.com/#sle).
  - b. CommScope: [www.commscope.com/#sle](http://www.commscope.com/#sle).
  - c. Siemon Company: [www.siemon.com/#sle](http://www.siemon.com/#sle).
2. Connector Blocks for Category 5e and Up Cabling: Type 110 insulation displacement connectors; capacity sufficient for cables to be terminated plus 25 percent spare.
3. Patch Panels for Copper Cabling: Sized to fit EIA/ECA-310 standard 19 inch (482.6 mm) wide equipment racks; 0.09 inch (2.2 mm) thick aluminum; cabling terminated on Type 110 insulation displacement connectors; printed circuit board interface.
  - a. Jacks: Non-keyed RJ-45, suitable for and complying with same standard as cable to be terminated; maximum 48 ports per standard width panel.
  - b. Capacity: Provide ports sufficient for cables to be terminated plus 25 percent spare.
  - c. Labels: Factory installed laminated plastic nameplates above each port, numbered consecutively; comply with TIA-606.
  - d. Provide incoming cable strain relief and routing guides on back of panel.
4. Product(s):
  - a. Belden; REVConnect Patch Panels: [www.belden.com/#sle](http://www.belden.com/#sle).
  - b. Belden; KeyConnect Patch Panels: [www.belden.com/#sle](http://www.belden.com/#sle).
  - c. Belden; DataConnect Patch Panels: [www.belden.com/#sle](http://www.belden.com/#sle).
  - d. CommScope; SYSTIMAX Copper Panels; 360-IPR-1100-XX Series Patch Panels: [www.commscope.com/#sle](http://www.commscope.com/#sle).
  - e. CommScope; Uniprise Copper Panels; UNP-XX-DM Series Patch Panels: [www.commscope.com/#sle](http://www.commscope.com/#sle).

**B. Fiber Optic Cross-Connection Equipment:**

1. Manufacturers:
    - a. Belden: [www.belden.com/#sle](http://www.belden.com/#sle).
    - b. CommScope: [www.commscope.com/#sle](http://www.commscope.com/#sle).
  2. Patch Panels for Fiber Optic Cabling: Sized to fit EIA/ECA-310 standard 19 inch (482.6 mm) wide equipment racks; 0.09 inch (2.2 mm) thick aluminum.
    - a. Adapters: As specified above under FIBER OPTIC CABLE AND INTERCONNECTING DEVICES; maximum of 24 duplex adaptors per standard panel width.
    - b. Labels: Factory installed laminated plastic nameplates above each port, numbered consecutively; comply with TIA-606.
    - c. Provide incoming cable strain relief and routing guides on back of panel.
    - d. Provide rear cable management tray at least 8 inches (203 mm) deep with removable cover.
    - e. Provide dust covers for unused adapters.
  3. Product(s):
    - a. Belden; FiberExpress DCX Patch Panel System: [www.belden.com/#sle](http://www.belden.com/#sle).
    - b. Belden; FiberExpress DCX ODF (Optical Distribution Frame) Cabinets: [www.belden.com/#sle](http://www.belden.com/#sle).
    - c. Belden; FiberExpress FX ECX Patch Panel System: [www.belden.com/#sle](http://www.belden.com/#sle).
    - d. Belden; FiberExpress FX UHD Patch Panel System: [www.belden.com/#sle](http://www.belden.com/#sle).
    - e. CommScope; SYSTIMAX Fiber Panels; HD Series Patch Panels: [www.commscope.com/#sle](http://www.commscope.com/#sle).
    - f. CommScope; Uniprise Fiber Panels; SD Series Patch Panels: [www.commscope.com/#sle](http://www.commscope.com/#sle).
- C. Backboards: Interior grade plywood without voids, 3/4 inch (19 mm) thick; UL-labeled fire-retardant.
1. Do not paint over UL label.

## 2.06 COMMUNICATIONS OUTLETS

- A. Manufacturers:
1. Belden: [www.belden.com/#sle](http://www.belden.com/#sle).
  2. CommScope: [www.commscope.com/#sle](http://www.commscope.com/#sle).
  3. Siemon Company: [www.siemon.com/#sle](http://www.siemon.com/#sle).
- B. Outlet Boxes: Comply with Section 260533.16.
1. Provide depth as required to accommodate cable manufacturer's recommended minimum conductor bend radius.
- C. Wall Plates:
1. Comply with system design standards and UL 514C.
  2. Accepts modular jacks/inserts.
  3. Capacity:
    - a. Voice Only Outlets: 1 ports.

- b. Data or Combination Voice/Data Outlets: 2 ports.
- 4. Wall Plate Material/Finish - Flush-Mounted Outlets: Match wiring device and wall plate finishes specified in Section 262726.
- 5. Product(s):
  - a. Belden; KeyConnect Faceplates: [www.belden.com/#sle](http://www.belden.com/#sle).
  - b. CommScope Faceplates; M Series: [www.commscope.com/#sle](http://www.commscope.com/#sle).

## **2.07 GROUNDING AND BONDING COMPONENTS**

- A. Comply with TIA-607.
- B. Comply with Section 260526.

## **2.08 IDENTIFICATION PRODUCTS**

- A. Comply with TIA-606.

## **2.09 ACCESSORIES**

- A. Inside-Plant Fabric Innerduct:
  - 1. Listed as complying with UL 2024; plenum rated.
  - 2. Products:
    - a. MaxCell Innerduct; MaxCell Premise: [www.maxcell.us/#sle](http://www.maxcell.us/#sle).

## **2.10 SOURCE QUALITY CONTROL**

- A. Factory test cables according to TIA-568 (SET).

# **PART 3 EXECUTION**

## **3.01 INSTALLATION - GENERAL**

- A. Comply with latest editions and addenda of TIA-570, TIA-607, NFPA 70, and SYSTEM DESIGN as specified in PART 2.
- B. Comply with Communication Service Provider requirements.
- C. Grounding and Bonding: Perform in accordance with TIA-607 and NFPA 70.

## **3.02 INSTALLATION OF PATHWAYS**

- A. Install pathways with the following minimum clearances:
  - 1. 48 inches (1220 mm) from motors, generators, frequency converters, transformers, x-ray equipment, and uninterruptible power systems.
  - 2. 12 inches (300 mm) from power conduits and cables and panelboards.
  - 3. 5 inches (125 mm) from fluorescent and high frequency lighting fixtures.
  - 4. 6 inches (150 mm) from flues, hot water pipes, and steam pipes.
- B. Outlet Boxes:
  - 1. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of telecommunications outlets provided under this section.

## **3.03 INSTALLATION OF EQUIPMENT AND CABLING**

- A. Cabling:

1. Do not bend cable at radius less than manufacturer's recommended bend radius; for unshielded twisted pair use bend radius of not less than 4 times cable diameter.
  2. Do not over-cinch or crush cables.
  3. Do not exceed manufacturer's recommended cable pull tension.
  4. When installing in conduit, use only lubricants approved by cable manufacturer and do not chafe or damage outer jacket.
- B. Service Loops (Slack or Excess Length): Provide the following minimum extra length of cable, looped neatly:
1. At Distribution Frames: 120 inches (3000 mm).
  2. At Outlets - Copper: 12 inches (305 mm).
  3. At Outlets - Optical Fiber: 39 inches (1000 mm).
- C. Copper Cabling:
1. Category 5e and Above: Maintain cable geometry; do not untwist more than 1/2 inch (12 mm) from point of termination.
  2. For 4-pair cables in conduit, do not exceed 25 pounds (110 N) pull tension.
  3. Use T568B wiring configuration.
- D. Fiber Optic Cabling:
1. Prepare for pulling by cutting outer jacket for 10 inches (250 mm) from end, leaving strength members exposed. Twist strength members together and attach to pulling eye.
  2. Support vertical cable at intervals as recommended by manufacturer.
- E. Identification:
1. Use wire and cable markers to identify cables at each end.
  2. Use manufacturer-furnished label inserts, identification labels, or engraved wallplate to identify each jack at communications outlets with unique identifier.
  3. Use identification nameplate to identify cross-connection equipment, equipment racks, and cabinets.

### 3.04 FIELD QUALITY CONTROL

- A. Comply with inspection and testing requirements of specified installation standards.
- B. Visual Inspection:
1. Inspect cable jackets for certification markings.
  2. Inspect cable terminations for color coded labels of proper type.
  3. Inspect outlet plates and patch panels for complete labels.
- C. Testing - Copper Cabling and Associated Equipment:
1. Test operation of shorting bars in connection blocks.
- D. Testing - Fiber Optic Cabling:

- E. Final Testing: After all work is complete, including installation of telecommunications outlets, and telephone dial tone service is active, test each voice jack for dial tone.

**END OF SECTION**

**SECTION 281523**  
**INTERCOM ENTRY SYSTEMS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Intercom entry system and associated door/entry stations, interior stations, and accessories.

**1.02 RELATED REQUIREMENTS**

- A. Section 078400 - Firestopping.
- B. Section 260526 - Grounding and Bonding for Electrical Systems.
- C. Section 260533.13 - Conduit for Electrical Systems.
- D. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- E. Section 282000 - Video Surveillance: For interface with intercom entry system.

**1.03 REFERENCE STANDARDS**

- A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the placement of intercom stations with millwork, furniture, equipment, etc. installed under other sections or by others.
  - 2. Coordinate the work with other installers to provide power for equipment at required locations.
  - 3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Preinstallation Meetings:
  - 1. Conduct meeting with facility representative to review intercom station and equipment locations.
- C. Sequencing:
  - 1. Do not install intercom stations until final surface finishes and painting are complete.

**1.05 SUBMITTALS**

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for each system component. Include configurations, standard wiring diagrams, dimensions, finishes, service condition requirements, and installed features.

- B. Shop Drawings: Include plan views indicating locations of system components and proposed size, type, and routing of conduits and/or cables. Include system interconnection schematic diagrams.
- C. Project Record Documents: Record actual locations of system components and installed wiring arrangements and routing.

#### **1.06 QUALITY ASSURANCE**

- A. Comply with the following:
  - 1. ADA Standards.
  - 2. NFPA 70 (National Electrical Code).
  - 3. Applicable TIA/EIA standards.
- B. Manufacturer Qualifications: Company engaged in manufacturing the products specified in this section with minimum three years documented experience.
- C. Products: Listed, classified, and labeled as suitable for the purpose intended.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.
- B. Store products in manufacturer's unopened packaging, keep dry and protect from damage until ready for installation.

#### **1.08 FIELD CONDITIONS**

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

#### **1.09 WARRANTY**

- A. Provide minimum one year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Intercom Entry System:
  - 1. Aiphone Corporation: [www.aiphone.com/#sle](http://www.aiphone.com/#sle).
  - 2. Alpha Communications: [www.alphacommunications.com/#sle](http://www.alphacommunications.com/#sle).
  - 3. BEC Integrated Solutions: [www.becintegrated.com/#sle](http://www.becintegrated.com/#sle).
  - 4. LiftMaster; CAPXLV2 Smart Video Intercom: [www.liftmaster.com/#sle](http://www.liftmaster.com/#sle).
  - 5. ZKTeco USA; Aura12: [www.zktecousa.com/#sle](http://www.zktecousa.com/#sle).

#### **2.02 INTERCOM ENTRY SYSTEM**

- A. Provide new intercom entry system consisting of required equipment, conduit, boxes, wiring, connectors, hardware, accessories, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.
- B. System Description:

1. System Type: Audio-video, IP network.
  2. System Capacity: As required for devices indicated, with minimum 25 percent spare capacity.
  3. Interface with Other Systems:
    - a. Provide products compatible with other systems requiring interface with intercom entry system.
- C. Door/Entry Stations:
1. Vandal resistant, with tamper proof hardware.
  2. Suitable for the environment where installed.
  3. Provide means to initiate call to designated interior station(s).
  4. Provide for hands-free two-way communication with interior station(s).
  5. Audio-Video Door/Entry Station:
    - a. Furnished with integral video camera for door/entry monitoring and visitor identification.
    - b. Call Initiation: Field-programmable directory with alphanumeric display and keypad; initiates call to user selected interior station.
      - 1) Minimum Number of Programmable Directory Entries: As required for number of interior stations connected plus 25 percent spare.
    - c. Finish: Stainless steel.
- D. Interior Stations:
1. Audio-Video Master Station:
    - a. Provides for hands-free and handset two-way communication with designated door/entry station(s) and other interior station(s).
    - b. Provide means for unlocking/releasing door corresponding to door/entry station communication is established with.
    - c. Provide means to initiate video monitoring of connected door/entry station(s).
    - d. Mounting: Wall or desk.
    - e. Features:
      - 1) Adjustable audible call notification volume.
      - 2) Adjustable communication volume.
      - 3) Adjustable LCD screen brightness.
      - 4) Manual video recording capability.
- E. Software:
1. Mobile Application for Residents:
    - a. Communication with door/entry stations.
    - b. Remote door unlocking/releasing for visitors.
  2. Software for Property Managers:
    - a. User access management.
    - b. Event logs.
- F. Accessories:

1. Provide components as indicated or as required for a complete operating system.
2. Wiring: Provide manufacturer's recommended cables as indicated or as required for connections between system components.
3. Provide accessory racks/cabinets as indicated or as required for equipment mounting.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that characteristics of system components are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive system components.
- D. Verify that conditions are satisfactory for installation prior to starting work.

#### **3.02 INSTALLATION**

- A. Perform work in accordance with NECA 1 (general workmanship).
- B. Install products in accordance with manufacturer's instructions.
- C. Provide grounding and bonding in accordance with Section 260526.
- D. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.
- E. Identify system wiring and components in accordance with Section 260553.

#### **3.03 FIELD QUALITY CONTROL**

- A. Test to verify wiring is free of shorts and grounds.
- B. Prepare and start system in accordance with manufacturer's instructions.
- C. Test system for proper operation.
- D. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.
- E. Submit detailed reports indicating inspection and testing results and corrective actions taken.

#### **3.04 CLEANING**

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

#### **3.05 CLOSEOUT ACTIVITIES**

- A. Demonstration: Demonstrate proper operation of system to Owner, and correct deficiencies or make adjustments as directed.

#### **3.06 PROTECTION**

- A. Protect installed system components from subsequent construction operations.

**END OF SECTION**

**SECTION 282000  
VIDEO SURVEILLANCE**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Video surveillance system requirements.
- B. Video recording and viewing equipment.
- C. Cameras.

**1.02 RELATED REQUIREMENTS**

- A. Section 260526 - Grounding and Bonding for Electrical Systems.
- B. Section 260529 - Hangers and Supports for Electrical Systems.
- C. Section 260533.13 - Conduit for Electrical Systems.
- D. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- E. Section 281000 - Access Control: For interface with video surveillance system.
- F. Section 283111 - Building Intrusion Detection: For interface with video surveillance system.

**1.03 REFERENCE STANDARDS**

- A. 47 CFR 15 - Radio Frequency Devices; current edition.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- C. NECA 303 - Standard for Installing and Maintaining Closed-Circuit Television (CCTV) Systems; 2019.
- D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the placement of cameras with structural members, ductwork, piping, equipment, luminaires, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
  - 2. Coordinate the work with other installers to provide power for cameras and equipment at required locations.
  - 3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Preinstallation Meetings:
  - 1. Conduct meeting with facility representative to review camera and equipment locations and camera field of view objectives.

**1.05 SUBMITTALS**

- A. Shop Drawings: Include plan views indicating locations of system components and proposed size, type, and routing of conduits and/or cables. Include elevations and details of proposed equipment arrangements. Include system interconnection schematic diagrams. Include requirements for interface with other systems.
- B. Design Data:
  - 1. Standby battery/UPS calculations.
  - 2. Video storage capacity calculations.
- C. Maintenance contracts.

**1.06 QUALITY ASSURANCE**

- A. Comply with the following:
  - 1. NFPA 70.
  - 2. Applicable TIA/EIA standards.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

**1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions and NECA 303.
- B. Store products in manufacturer's unopened packaging, keep dry and protect from damage until ready for installation.

**1.08 FIELD CONDITIONS**

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

**1.09 WARRANTY**

- A. Provide minimum one year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

**PART 2 PRODUCTS****2.01 MANUFACTURERS**

- A. Video Recording and Viewing Equipment and Software:
  - 1. Axis Communications: [www.axis.com/#sle](http://www.axis.com/#sle).
  - 2. Bosch Security Systems: [www.boschsecurity.us/#sle](http://www.boschsecurity.us/#sle).
  - 3. Honeywell International, Inc; Honeywell Security: [www.buildings.honeywell.com/#sle](http://www.buildings.honeywell.com/#sle).
  - 4. Pelco, a brand of Schneider Electric: [www.pelco.com/#sle](http://www.pelco.com/#sle).
  - 5. VIVOTEK: [www.vivotek.com/#sle](http://www.vivotek.com/#sle).
- B. Cameras:
  - 1. Axis Communications: [www.axis.com/#sle](http://www.axis.com/#sle).

2. Bosch Security Systems: [www.boschsecurity.us/#sle](http://www.boschsecurity.us/#sle).
3. Honeywell International, Inc; Honeywell Security:  
[www.buildings.honeywell.com/#sle](http://www.buildings.honeywell.com/#sle).
4. Pelco, a brand of Schneider Electric: [www.pelco.com/#sle](http://www.pelco.com/#sle).
5. VIVOTEK: [www.vivotek.com/#sle](http://www.vivotek.com/#sle).

## 2.02 VIDEO SURVEILLANCE SYSTEM

- A. Provide new video surveillance system consisting of all required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, software, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.
- B. System Description: IP system with connection to network (IP) cameras.
- C. Interface with Other Systems:
  1. Provide products compatible with other systems requiring interface with video surveillance system.
- D. Provide products listed, classified, and labeled as suitable for the purpose intended.
- E. Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of 47 CFR 15, for Class B, consumer application.

## 2.03 VIDEO RECORDING AND VIEWING EQUIPMENT AND SOFTWARE

- A. Provide video recording and viewing equipment compatible with cameras to be connected.
- B. Network Video Recorders (NVRs):
  1. Supports connection of network (IP) cameras.
  2. Supports continuous and event-based recording.
- C. Computers:
  1. Workstation Computers: Unless otherwise indicated, workstation computer hardware not furnished by video surveillance system manufacturer to be provided by Contractor as part of work of this section, meeting video surveillance system equipment manufacturer's minimum requirements.
- D. Software:
  1. Unless otherwise indicated, provide all software and licenses required for fully operational system.
  2. Video Management System:
    - a. Products:
      - 1) Axis Communications; AXIS Camera Station Pro: [www.axis.com/#sle](http://www.axis.com/#sle).
      - 2) Honeywell International, Inc; Honeywell Security; MAXPRO Series:  
[www.buildings.honeywell.com/#sle](http://www.buildings.honeywell.com/#sle).
      - 3) Honeywell International, Inc; Honeywell Security; MAXPRO Video Management Software: [www.buildings.honeywell.com/#sle](http://www.buildings.honeywell.com/#sle).
      - 4) Siemens Industry, Inc; Siveillance Video: [www.siemens.com/#sle](http://www.siemens.com/#sle).

E. Monitors:

1. Unless otherwise indicated, monitors to be provided by Contractor as part of work of this section.

## 2.04 CAMERAS

- A. Provide cameras and associated accessories suitable for operation under the service conditions at the installed location. Provide additional components (e.g. enclosures, heaters, blowers, etc.) as required.
- B. Where not factory-installed, provide additional components (e.g. lenses, mounting accessories, etc.) as necessary for complete installation.
- C. Network (IP) Cameras:
1. Signal-to-Noise Ratio: Not less than 50 dB.
  2. Provide the following standard features:
    - a. Automatic electronic shutter.
    - b. Automatic gain control.
    - c. Automatic white balance.
    - d. Web-based interface for remote viewing and setup.
    - e. Password protected security access.

## 2.05 ACCESSORIES

- A. Camera Enclosures: Where not factory-installed, provide camera enclosures suitable for operation under service conditions at installed location.
- B. Camera Mounting Supports: Where not factory installed, provide mounting supports necessary for installation.
1. Products:
    - a. StrongPoles, LLC; HD Parapet Camera Mount: [www.strongpoles.com/#sle](http://www.strongpoles.com/#sle).
    - b. StrongPoles, LLC; Parapet Mount: [www.strongpoles.com/#sle](http://www.strongpoles.com/#sle).
    - c. StrongPoles, LLC; Surface Mount Pole: [www.strongpoles.com/#sle](http://www.strongpoles.com/#sle).
- C. Provide components as indicated or as required for connection of video surveillance system to devices and other systems indicated.
- D. Provide components as indicated or as required for system power and network connections.
- E. Provide cables as indicated or as required for connections between system components.
- F. Provide accessory racks/cabinets as indicated or as required for equipment mounting.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that ratings and configurations of system components are consistent with the indicated requirements.

- C. Verify that mounting surfaces are ready to receive system components.
- D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to system where applicable.
- E. Verify that conditions are satisfactory for installation prior to starting work.

### **3.02 INSTALLATION**

- A. Install video surveillance system in accordance with NECA 1 (general workmanship) and NECA 303.
- B. Install products in accordance with manufacturer's instructions.
- C. Provide required support and attachment in accordance with Section 260529.
- D. Provide grounding and bonding in accordance with Section 260526.
- E. Identify system wiring and components in accordance with Section 260553.

### **3.03 FIELD QUALITY CONTROL**

- A. Prepare and start system in accordance with manufacturer's instructions.
- B. Adjust cameras to provide desired field of view and produce suitable images under all service lighting conditions.
- C. Program system parameters according to requirements of Owner.
- D. Test for proper interface with other systems.
- E. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

### **3.04 CLEANING**

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

### **3.05 CLOSEOUT ACTIVITIES**

- A. Training: Train Owner's personnel on operation, adjustment, and maintenance of system.
  - 1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

### **3.06 PROTECTION**

- A. Protect installed system components from subsequent construction operations.

### **3.07 MAINTENANCE**

- A. Provide to Owner, a proposal as an alternate to the base bid, a separate maintenance contract for the service and maintenance of video surveillance system for two years from date of Substantial Completion; Include a complete description of preventive maintenance, systematic examination, adjustment, cleaning, inspection, and testing, with a detailed schedule.
- B. Provide trouble call-back service upon notification by Owner:

1. Include allowance for call-back service during normal working hours at no extra cost to Owner.
2. Owner will pay for call-back service outside of normal working hours on an hourly basis, based on actual time spent at site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.

**END OF SECTION**

**SECTION 284600  
FIRE DETECTION AND ALARM**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Fire alarm system and associated components, including control units, related equipment, initiating devices, and notification appliances.

**1.02 RELATED REQUIREMENTS**

- A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: For non-power-limited cables.
- B. Section 260526 - Grounding and Bonding for Electrical Systems.
- C. Section 260533.16 - Boxes for Electrical Systems.
- D. Section 263213 - Engine Generators: For interface with fire alarm system.
- E. Section 284614 - Single and Multiple Station Alarms.

**1.03 ABBREVIATIONS AND ACRONYMS**

- A. AHJ: Authorities having jurisdiction.
- B. BAS: Building automation system.
- C. DMNS: Distributed mass notification system.
- D. ECS: Emergency communications system.
- E. EoL: End-of-line.
- F. EVACS: Emergency voice/audio communication systems.
- G. FACU: Fire alarm control unit.
- H. HVAC: Heating, ventilation, and air conditioning.
- I. IDC: Initiating device circuit.
- J. LAN: Local area network.
- K. MNS: Mass notification system.
- L. NAC: Notification appliance circuit.
- M. NPLFA: Non-power-limited fire alarm.
- N. PLFA: Power-limited fire alarm.
- O. SLC: Signaling line circuit.
- P. SOO: Sequence of operation.

**1.04 REFERENCE STANDARDS**

- A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.

- B. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- C. ASME A17.1 - Safety Code for Elevators and Escalators Includes Requirements for Elevators, Escalators, Dumbwaiters, Moving Walks, Material Lifts, and Dumbwaiters with Automatic Transfer Devices; 2022.
- D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- E. NECA 90 - Standard for Commissioning Building Electrical Systems; 2015.
- F. NECA 305 - Standard for Fire Alarm System Job Practices; 2018.
- G. NFPA 3 - Standard for Commissioning of Fire Protection and Life Safety Systems; 2024.
- H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. NFPA 72 - National Fire Alarm and Signaling Code; Most Recent Edition Cited by Referring Code or Reference Standard.
- J. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.
- K. UL 38 - Standard for Manual Signaling Boxes for Fire Alarm Systems; Current Edition, Including All Revisions.
- L. UL 268 - Standard for Smoke Detectors for Fire Alarm Systems; Current Edition, Including All Revisions.
- M. UL 268A - Standard for Smoke Detectors for Duct Application; Current Edition, Including All Revisions.
- N. UL 464 - Standard for Audible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories; Current Edition, Including All Revisions.
- O. UL 497B - Standard for Protectors for Data Communications and Fire-Alarm Circuits; Current Edition, Including All Revisions.
- P. UL 864 - Control Units and Accessories for Fire Alarm Systems; Current Edition, Including All Revisions.
- Q. UL 1449 - Standard for Surge Protective Devices; Current Edition, Including All Revisions.
- R. UL 1971 - Standard for Signaling Devices for the Hearing Impaired; Current Edition, Including All Revisions.
- S. UL 2075 - Standard for Gas and Vapor Detectors and Sensors; Current Edition, Including All Revisions.

#### **1.05 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate arrangement of equipment with dimensions and clearance requirements of actual equipment.

2. Coordinate placement of devices and notification appliances with potential conflicts or view obstructions.
  3. Coordinate work to provide power for equipment at required locations (e.g., smoke dampers, type of actuators, line or local control transformer, zoning, grouping and circuit activations).
  4. Coordinate requirements for branch circuit protection, identification, and shunt trip if applicable.
  5. Coordinate reflected ceiling plans to avoid conflicting placements; maintain minimum diffuser and detector clearances as indicated.
  6. Coordinate submittals to confirm equipment and associated components are capable of indicated settings, and manufacturer documentation identifies required compatible product listings.
  7. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
  8. Elevators or Escalators: See Division 14.
- B. Preinstallation Meetings:
1. Conduct meeting with facility representative to review devices, notification appliances, and equipment locations.
  2. Conduct meeting with facility representative and other related equipment manufacturers to discuss fire alarm system interface requirements.
  3. Conduct meeting to review anticipated installation of code-required smoke control requirements, product solutions, and SOO.
  4. Convene one week before starting work for review of documented SOO for system applications.
- C. Sequencing:
1. Verify exact termination locations required for boxes, enclosures, and equipment.
  2. Do not install devices or notification appliances until final surface finishes, painting, and cleaning are complete, unless otherwise required by AHJ.
  3. Do not begin installation of conductors and cables until installation of conduit and pathways between termination points is complete.
  4. Sequence work to protect cabling (e.g., overspray painting, physical stress, and insulation damage or covering markings).
  5. Verify naming convention for equipment identification, including room names and numbers, prior to creation of final drawings, reports, and labels.
- D. Scheduling:
1. Arrange access to facility for data collection with facility representative.
  2. Where work involves interruption of existing electrical or fire alarm system service, arrange interruption with Owner.
    - a. Arrange test start and end with responsible reporting service. Confirm system normal operating mode and record as-found and as-left settings.

- b. Arrange work to disable individual devices or circuits for minimal disruption if possible.
- c. Arrange in accordance with NFPA 72 fire alarm system impairment requirements.
- d. Where required by AHJ, arrange systems or partial system out of service interruption in accordance with requirements of building, life safety, and fire codes (e.g., approved fire watch plus required notifications, tags at each fire department connection and control valve, and AHJ notification when excess hours).

#### 1.06 SUBMITTALS

- A. Evidence of designer qualifications.
- B. Comply with NFPA 72 chapter "Documentation," including noting names of installers, owners, and system classification information.
- C. Design Documents: Submit all information required for plan review and permitting by AHJ, including floor plans, riser diagrams, and description of operation.
  1. Copy (if any) of list of data required by AHJ.
  2. NFPA 72 "Record of Completion", filled out to extent known at time.
  3. Clear and concise description of operation, with input/output matrix similar to that shown in NFPA 72 Appendix A, and complete listing of software required.
  4. Manufacturer's detailed product data sheet for each component, including wiring diagrams, and circuit length limitations. Catalog pages and product descriptions include ratings, dimensions, finishes, service conditions, and included features.
  5. Certification by manufacturer of FACU that system design complies with Contract Documents.
  6. Certification by Contractor that system design complies with Contract Documents.
- D. Shop Drawings: Submit installation documentation required for plan review and permitting by AHJ, including floor plans showing locations of fire alarm system components, enlarged drawn to identified scale plan view, and riser diagrams.
  1. System zone boundaries and interfaces to fire safety systems.
  2. Show locations of components, circuits, and raceways; mark components with identifiers used in control unit programming.
  3. Include elevations and details of proposed equipment arrangements.
  4. Include system interconnection schematic riser diagram showing proposed and approved cable size and type; coordinated with floor plans and describing circuit class, survivability, and application specific information required by NFPA 72.
  5. Include typical wiring diagrams for devices, notification appliances, remote indicators, annunciators, remote test stations, and EoL and power supervisory devices.
  6. Include requirements and control diagrams for interfacing with other systems.

7. Circuit layouts; number, size, and type of raceways and conductors; conduit fill calculations; standby and spare capacity calculations; notification appliance circuit loop resistance and voltage drop calculations, including spare capacity.
  8. List of devices and notification appliances on each SLC, with spare capacity indicated.
  9. Manufacturer's detailed data sheet for each component, including wiring diagrams, installation instructions, and circuit length limitations.
  10. Description of power supplies; if secondary power is by battery include calculations demonstrating adequate battery power.
  11. Detailed drawing of graphic annunciators, displays, and interfaces.
  12. Certification by either FACU manufacturer or manufacturer of related equipment.
  13. Certification by FACU manufacturer that system design complies with Contract Documents.
  14. Certification by Contractor that system design complies with Contract Documents.
- E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- F. Evidence of installer qualifications.
- G. Evidence of maintenance contractor qualifications, if different from installer.
- H. Inspection and Test Reports:
1. Submit inspection and test plan prior to closeout demonstration.
  2. Submit documentation of satisfactory inspections and tests.
  3. Submit NFPA 72 "Inspection and Test," filled out.
- I. Operating and Maintenance Data: See Section 01 7800 for additional requirements; revise and resubmit until acceptable; have one set available during closeout demonstration:
1. Complete set of specified design documents, as approved by AHJ.
  2. Additional printed set of project record documents and closeout documents, bound or filed in same manuals.
  3. Contact information for firm that will be providing contract maintenance and trouble call-back service.
  4. List of recommended spare parts, tools, and instruments for testing.
  5. Replacement parts list with current prices, and source of supply.
  6. Detailed troubleshooting guide and large scale input/output matrix.
  7. Preventive maintenance, inspection, and testing schedule complying with NFPA 72; provide printed copy and computer format acceptable to Owner.
  8. Detailed but easy to read explanation of procedures require recording of system trouble events by qualified personnel, such as when routine testing is being conducted for fire drills and when entering into contracts for building renovations.

- J. Project Record Documents: See Section 01 7800 for additional requirements, have one set available during closeout demonstration:
  - 1. Complete set of floor plans showing actual installed locations of components, conduit, and zones.
  - 2. "As installed" wiring and schematic diagrams, with final terminal identifications.
  - 3. "As programmed" operating sequences, including control events by device, and updated input/output chart.
- K. Closeout Documents:
  - 1. Certification by manufacturer that system has been installed in compliance with manufacturer's installation requirements, is complete, and is in satisfactory operating condition.
  - 2. NFPA 72 "Record of Completion," filled out completely and signed by installer and authorized representative of AHJ.

### **1.07 QUALITY ASSURANCE**

- A. Designer Qualifications: NICET Level III (three) or Level IV (four) certified fire alarm technician or registered fire protection engineer, employed by FACU manufacturer, Contractor, or installer, with experience designing fire alarm systems in jurisdictional area of AHJ.
- B. Installer Qualifications: Firm with minimum three years documented experience installing fire alarm systems of specified type and providing contract maintenance service as regular part of their business.
  - 1. Authorized representative of FACU manufacturer; submit manufacturer's certification that installer is authorized; include name and title of manufacturer's representative making certification.
  - 2. Installer Personnel: At least two years of experience installing fire alarm systems.
  - 3. Supervisor: Level III (three) or Level IV (four) certified fire alarm technician; furnish name and address.
- C. Manufacturer Qualifications: Company specialized in manufacturing products specified in this section with at least three years of documented experience.
- D. Maintenance Contractor Qualifications: Same entity as installer or different entity with specified qualifications.

### **1.08 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions and NECA 305.
- B. Handle carefully to avoid damage to internal components, enclosure, and finish.
- C. Store products in manufacturer's unopened packaging, keep dry and protect from damage until ready for installation.

## 1.09 FIELD CONDITIONS

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.
- B. Do not exceed maximum ambient temperature requirements for batteries at any time, which reduces battery service life. Replace batteries exposed to temperatures in excess of manufacturer's requirements.
- C. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F (minus 10 degrees C), unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Architect and obtain direction before proceeding with work.

## 1.10 WARRANTY

- A. Fire Alarm Control Units and Accessory Equipment: Provide minimum 3-year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

## PART 2 PRODUCTS

### 2.01 FIRE ALARM SYSTEM

- A. General Requirements:
  - 1. Provide new fire alarm system complying with NFPA 70, NFPA 72, NFPA 90A, and consisting of required equipment, conduit, cabinets, outlet boxes, wiring, connectors, hardware, supports, accessories, components, software, and system programming as necessary for complete operating system that provides functional intent indicated.
  - 2. Comply with the following; where requirements conflict, order of precedence of requirements is as listed:
    - a. 36 CFR 1191 and ADA Standards.
    - b. Requirements of AHJ.
    - c. Applicable local codes.
    - d. Contract Documents.
    - e. NFPA 72; "should" is mandatory; where conflicts between requirements require deviation, identify deviations clearly on design documents.
  - 3. Fire Alarm System Products:
    - a. Listed, classified, and labeled as suitable for purpose intended.
    - b. Installation Environments: Provide products suitable for their respective indoor and outdoor applications.
  - 4. Fire Alarm System Design Information:
    - a. Building Code: Comply with applicable building code.
      - 1) Principle Occupancy: As indicated on Architect code summary drawings.
      - 2) Principle Use: As indicated on Architect code summary drawings.
      - 3) Elevators: As indicated on Architect code summary drawings.

- (a) Emergency Operation: As indicated on Architect code summary drawings.
    - 4) Occupant Evacuation Method: Total building.
  - b. NFPA 72 Fire Alarm System Classification: Protected premises.
  - c. Smoke and Heat Detector Coverage: Partial or selective coverage in accordance with NFPA 72.
  - d. Notification Appliance Zones:
    - 1) See fire alarm system floor plans on drawings.
5. Provide fire alarm circuits in accordance with NFPA 70.
- a. Comply with methods of interconnecting FACUs in accordance with NFPA 72 and NFPA 70.
  - b. Power Sources:
    - 1) Comply with requirements for power supplies of emergency systems in accordance with NFPA 70.
    - 2) Primary: Dedicated branch circuits from facility power distribution system.
    - 3) Secondary: Storage batteries with capacity to operate system for period specified by NFPA 72.
  - c. Wiring and Wiring Methods:
    - 1) General Requirements:
      - (a) Comply with requirements for wiring and wiring methods in accordance with NFPA 70.
      - (b) Conductors and Cables Installed Exposed in Spaces Used for Environmental Air (only where specifically permitted): Plenum-rated, listed and labeled as suitable for use in return air plenums.
      - (c) Special Occupancies: Comply with NFPA 70.
      - (d) Comply with NFPA 70 for wire and cable plenum, riser, general-purpose, limited-use, undercarpet, and underground applications.
    - 2) Fire Alarm Circuits:
      - (a) Comply with NFPA 70 for conditions and types required for multiconductor cable systems.
      - (b) Non-Power-Limited Fire Alarm (NPLFA) Circuits:
        - (1) Provide dedicated NPLFA non-GFCI branch circuits for fire alarm equipment and marked by red identification in accordance with NFPA 70.
      - (c) Power-Limited Fire Alarm (PLFA) Circuits:
        - (1) Provide identification for PLFA circuits in accordance with NFPA 70.
6. Provide pathway class designations and pathway survivability, as defined in NFPA 72.
- a. Provide monitoring of conductors and other signaling channels for integrity and circuit performance.

- b. Pathway Class Designations:
  - 1) Unless otherwise indicated or required, pathways to meet the following requirements:
    - (a) SLCs: Class B (star, tee-tap, multi-tap, with no return).
    - (b) IDCs: Class B (daisy-chain with EoL resistor device installed at end of circuit).
    - (c) NACs: Class B (daisy-chain with EoL resistor device installed at end of circuit).
- B. Fire Alarm System Interfaces and Control Functions:
  - 1. UL 864 listed unless otherwise indicated.
  - 2. Descriptions below are intended to provide means for interface. See project SOOs, narrative, and input/output matrix for execution requirements.
  - 3. Provide initiating devices, interfaces, and control functions for emergency control function interfaces in accordance with NFPA 72.
  - 4. Provide monitoring of interconnected systems. Coordinate notification appliance alternate markings as indicated on drawings.
  - 5. Elevators:
    - a. Comply with ASME A17.1.
    - b. Elevator Shutoff:
      - 1) Elevator Machine Room Heat Detector:
        - (a) Shut down elevator power prior to hoistway sprinkler activation.
        - (b) Locate within 24 inches (610 mm) of each sprinkler in accordance with NFPA 72.
      - 2) Sprinkler Pressure or Waterflow: Shut down elevator power prior to hoistway sprinkler activation.
      - 3) For each elevator, provide output signal to stop elevator via addressable relay module and power isolation relay.
    - c. Elevator Emergency Recall Operation:
      - 1) Elevator Lobby, Hoistway, and Machine Room Smoke Detectors: Elevator recall for fire fighters' service.
      - 2) In each elevator machine room, provide interface for each elevator car or group of elevator cars as determined by AHJ via separate addressable relay modules for each output signal below, where applicable.
        - (a) Recall elevator to designated (primary) level.
        - (b) Recall elevator to alternate level.
        - (c) Smoke detection in elevator machine room (fire fighter's hat light).
  - 6. Other Interconnected Systems: For systems listed below, provide minimum of two monitoring point inputs each.
    - a. Gas Detection Systems: Including providing notification appliances as indicated on plans for CO<sub>2</sub> - Carbon Dioxide.
  - 7. HVAC Systems:
    - a. Air Handling Units (AHUs) and Roof Top Units (RTUs):

- 1) Provide duct smoke detector on supply side of air stream for units over 2,000 cfm.
  - 2) Provide duct smoke detector on return side of air stream for units over 15,000 cfm.
  - 3) Provide remote test station for each duct smoke detector unless explicitly indicated as not required.
  - 4) Provide output signal to shut down units with at least one duct smoke detector via addressable relay module.
  - 5) Where fire/smoke dampers are located downstream of unit, provide monitoring point input to determine that unit is not operational and subsequently provide output signal to close such dampers via addressable relay module and power isolation relay.
8. Fire/Smoke Dampers:
- a. Provide output signal to close fire/smoke damper via addressable relay module and power isolation relay.
- C. Sleeping Areas:
1. Quantity of Sleeping Locations or Units: As indicated on drawings.
  2. Devices Within Units:
    - a. Local Unit Detection/Alarm: Use hardwired 120 VAC single- and multiple-station alarms and accessory strobes as applicable.
      - 1) See Section 284614.
    - b. Building Fire Alarm Event Notification: Use fire alarm system-connected devices.
      - 1) Provide low frequency sounders in each unit as indicated and as required to achieve minimum of 75 dB at pillow in legally-defined bedrooms and 15 dB over ambient in other interior areas of unit.
      - 2) Synchronize notification appliances (sounders and strobes) within unit with each other and with common area notification appliances on same floor.
      - 3) FACU to control activation mapping, silencing, and restoration.

## 2.02 FIRE ALARM CONTROL UNITS AND RELATED EQUIPMENT

- A. Manufacturers:
1. Honeywell International, Inc; Honeywell Gamewell-FCI: [www.honeywell.com/#sle](http://www.honeywell.com/#sle).
  2. Honeywell International, Inc; Honeywell Notifier: [www.honeywell.com/#sle](http://www.honeywell.com/#sle).
  3. NAPCO Security Technologies, Inc: [www.napcosecurity.com/#sle](http://www.napcosecurity.com/#sle).
  4. Potter Electric Signal Company: [www.pottersignal.com/#sle](http://www.pottersignal.com/#sle).
  5. Siemens Industry: [www.siemens.com/#sle](http://www.siemens.com/#sle).
- B. Fire Alarm Control Units and Related Equipment: Listed and labeled as complying with UL 864.

- C. Provide cabinets and enclosures as indicated or as required to house system components.
- D. Fire Alarm Control Unit (FACU): Addressable.
  - 1. SLCs and IDCs: Configurable for Class B or Class A with additional modules.
  - 2. NACs: Integral and programmable with synchronization modules or cards as required.
  - 3. Power Supply: 120 VAC, 60 Hz, supplying necessary power for FACU.
  - 4. User-Interface: Touchscreen display for system interfacing and service mode settings, include password and user credentials; configurable for custom actions and incorporates historical event log.
  - 5. Support self-testing detector capability.
  - 6. Remote Annunciator Support: Up to 10.

### 2.03 FIRE ALARM SYSTEM INITIATING DEVICES

- A. Manufacturers:
  - 1. Honeywell International, Inc; Honeywell Gamewell-FCI: [www.honeywell.com/#sle](http://www.honeywell.com/#sle).
  - 2. Honeywell International, Inc; Honeywell Notifier: [www.honeywell.com/#sle](http://www.honeywell.com/#sle).
  - 3. NAPCO Security Technologies, Inc: [www.napcosecurity.com/#sle](http://www.napcosecurity.com/#sle).
  - 4. Siemens Industry: [www.siemens.com/#sle](http://www.siemens.com/#sle).
- B. General Requirements:
  - 1. Provide devices and associated accessories suitable for intended application and location to be installed. Unless otherwise indicated, use addressable devices and addressable interface modules only in clean, dry, indoor, nonhazardous locations.
  - 2. Surface-Mounted Devices: Provide manufacturer's accessory surface mount backboxes or suitable outlet/device box.
  - 3. Devices for Outdoor and Damp/Wet Locations: Weatherproof, suitable for outdoor use; provide manufacturer's accessory backboxes or enclosures in accordance with product listing.
  - 4. Devices for Hazardous/Classified Locations: Listed and labeled as suitable for classification of installed location.
- C. Manual Fire Alarm Boxes/Pull Stations:
  - 1. Description: Noncoded manual signaling boxes listed and labeled as complying with UL 38.
  - 2. Alarm Initiation: Configured for general alarm initiation unless otherwise indicated; presignal stations (where indicated) require use of key to initiate general alarm.
  - 3. Operation: Dual-action unless otherwise indicated or required.
    - a. Dual-Action Operation: First requires pushing, pulling, or lifting, then pulling of lever.
  - 4. Color: Red, in accordance with NFPA 72.

5. Station Reset: Requires use of key or tool.
- D. Spot-Type Detectors:
1. Utilize plug-in mounting to separate base with tamper-resistant feature; provide bases as indicated or as required.
  2. Smoke Detectors:
    - a. Listed and labeled as complying with UL 268.
    - b. Provide sensor type (e.g., photoelectric, ionization) as indicated.
  3. Carbon Monoxide Detectors:
    - a. Listed and labeled as complying with UL 2075.
    - b. Provide end-of-life notification.
- E. Duct Smoke Detectors:
1. Listed and labeled as complying with UL 268A.
  2. Ratings: Compatible with air velocity, temperature, and humidity requirements for installed duct.
  3. Housing: Select as required for application.
  4. Sampling Tubes: Select as required for installation in duct to be monitored.

#### **2.04 FIRE ALARM SYSTEM NOTIFICATION APPLIANCES**

- A. Manufacturers:
1. Honeywell International, Inc; Honeywell System Sensor:  
[www.honeywell.com/#sle](http://www.honeywell.com/#sle).
  2. Siemens Industry: [www.siemens.com/#sle](http://www.siemens.com/#sle).
- B. General Requirements:
1. Provide signaling notification appliances listed for fire-protective service and intended operating mode, public or private; suitable for connection to FACU notification appliance circuits.
  2. Provide notification appliances and associated accessories suitable for intended application and location to be installed. Use notification appliances only according to listed mounting (e.g. ceiling, wall).
  3. Surface-Mounted Notification Appliances: Provide manufacturer's accessory surface mount backboxes or suitable outlet/device box.
  4. Exterior Notification:
    - a. In addition to required occupant notification, provide notification appliances on exterior of building.
  5. Notification Appliance Derating: Include device derating adjustments in accordance with listing where applicable, including the following.
    - a. Where accessory protective guards or enclosures are utilized.
    - b. Where required by field conditions (e.g., ambient temperature and sound).
  6. Notification Appliance Color:
    - a. Wall-Mounted: Red.
    - b. Ceiling-Mounted: White.

- c. See drawings for mounting configuration indicated by symbols on floor plans, system interconnection diagrams, and details.
- C. Visible Notification Appliances:
  1. Public Mode Operation: Listed and labeled as complying with UL 1971.
  2. Strobes: Clear or nominal white lens with flash rate of 1 Hz unless otherwise indicated or required; xenon or LED light source with maximum pulse duration of 0.02 seconds; candela rating as indicated.
- D. Audible Notification Appliances:
  1. Listed and labeled as complying with UL 464.
  2. Rated Sound Pressure Level: As required to achieve design sound pressure levels, but not less than 75 dBA at 10 feet (3.1 m) for public mode operation or 45 dBA at 10 feet (3.1 m) for private mode operation in accordance with UL 464.
- E. Combination Notification Appliances: Comply with respective requirements for each signaling method.
- F. Accessories:
  1. Notification Appliance Bases: White, unless otherwise indicated.
  2. Provide guards to protect notification appliances where subject to mechanical damage; listed for use with notification appliance.
- G. Products:
  1. AtlasIED; Speakers for Fire Alarm: [www.atlasied.com/#sle](http://www.atlasied.com/#sle).
  2. Siemens Industry; AS/AH Series Horn/Strobe: [www.siemens.com/#sle](http://www.siemens.com/#sle).
  3. Siemens Industry; SEFH Series Speaker/Strobe: [www.siemens.com/#sle](http://www.siemens.com/#sle).

## 2.05 WIRE AND CABLE

- A. General Requirements:
  1. Comply with NFPA 70 listing and marking requirements for cables.
  2. Substitution of fire alarm listed cables for communication wiring, in accordance with NFPA 70, is not permitted.
  3. Provide cables as indicated or as required for connections between system components.
- B. Power-Limited Fire Alarm Cables (PLFA):
  1. Comply with applications of listed cables in accordance with Chapter 7 of NFPA 70.

## 2.06 ACCESSORIES

- A. Provide components as indicated or as required for connection of fire alarm system to devices and other systems indicated.
- B. Provide EoL resistors as required for wiring supervision.
- C. Protective Covers for Fire Alarm Devices:
  1. Listed to same standard as device being protected.

2. Outdoor Covers: Weather resistant, suitable for outdoor use; use only with outdoor-rated devices.
  3. Provide guards to protect devices where subject to mechanical damage; listed for use with detector.
    - a. Protective Covers for Manual Pull Stations:
      - 1) Provide protective covers with hinged access for manual pull stations.
      - 2) Listed and labeled as complying with UL 38.
      - 3) Outdoor Covers: Weather resistant, suitable for outdoor use; use only with outdoor rated devices.
- D. Surge Protection:
1. Line Voltage Surge Protection:
    - a. Provide for each line voltage circuit serving fire alarm system control units and related equipment (e.g., FACU, field booster panels, nodes, and transponders).
    - b. Listed and labeled as complying with UL 1449.
  2. Low Voltage Surge Protection:
    - a. Provide for each power-limited fire alarm circuit that enters or exits a building.
    - b. Listed as complying with UL 497B.
    - c. Provide voltage/current ratings suitable for circuit to be protected.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that mounting surfaces are ready to accept components and equipment, with suitable support frames and anchors installed where required.
- B. Verify ratings, configurations, and characteristics of system components.
- C. Verify rough-ins for field connections.
- D. Verify that work likely to damage fire alarm system has been completed.
- E. Verify that interior of building has been protected from weather.
- F. Perform preinstallation tests and inspections per manufacturer's instructions and in accordance with NECA 305.
- G. Verify that system bonding is in accordance with Section 260526.
- H. Do not energize system until deficiencies have been corrected.
- I. Verify that branch circuit wiring installation is completed, tested, and ready for connection to fire alarm system. Overcurrent protection ratings are consistent with circuit voltage and manufacturer's recommendations and nameplate data for equipment.

### 3.02 PREPARATION

- A. Prior to installation, confirm environment of installation area is clean, and with ambient temperature, humidity, and ventilation requirements are per manufacturer's written instructions.
  - 1. Clean and vacuum in accordance with manufacturer's written instructions. Confirm equipment ventilation holes are absent of obstructions and free for air flow.
  - 2. Clean pathways thoroughly to remove foreign materials before installing conductors and cables.
  - 3. Clean dirt, debris, plaster, and other foreign materials from equipment enclosures, cabinets, and outlet boxes.
  - 4. Clean surfaces to receive adhesive products according to manufacturer's instructions.
- B. Follow tool requirements for installation, including torquing adjustments, as listed in manufacturer documentation.
- C. Remove detector dust covers prior to system energization.

### 3.03 INSTALLATION

- A. Install field-devices, components, FACU and related equipment, and accessories in accordance with the following:
- B. Field Locations:
  - 1. Obtain Owner's approval of locations of devices and notification appliances before installation.
  - 2. Arrange equipment to provide minimum operational clearances and required maintenance access in accordance with manufacturer's instructions and NFPA 70.
  - 3. Conceal wiring, conduit, outlet boxes, and supports where installed in finished areas; maintain code-required access.
- C. Raceways and Supports:
  - 1. Coordinate locations of outlet boxes as required for installation. Only install boxes and equipment at locations based on application standards indicated in NFPA 72.
  - 2. Secure and support raceways at intervals complying with NFPA 70. Provide supports where vertical rise exceeds permissible limits.
  - 3. Install firestopping to preserve fire resistance rating of partitions and other elements.
- D. Wiring and Connections:
  - 1. Maintain separation of Class 1, Class 2, Class 3 remote-control, signaling, fire alarm circuits, and power-limited circuits in accordance with cable insulation class and NFPA 70.
  - 2. Maintain circuit pathway and class designations in accordance with NFPA 72 for configuration, separation, and survivability.

3. Comply with permitted and not permitted installations for wires, cables, cable routing assemblies, communications circuits, and fire alarm circuits in accordance with NFPA 70.
  4. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by AHJ. Provide independent support from building structure and suspended ceiling systems. Do not provide support from raceways, piping, ductwork, or other systems.
  5. Provide grounding and bonding in accordance with Section 260526.
  6. Comply with manufacturer's minimum cable sizes or ratings.
  7. Do not exceed manufacturer's recommended maximum power, signal, or network cable lengths between components.
  8. Provide network wiring in accordance with NFPA 70.
  9. Neatly train and bundle conductors inside boxes, wireways, and cabinets.
  10. See manufacturer's instructions for batteries.
- E. Fire Alarm System Components:
1. Install field-installed devices, components, relays, notification appliances, accessories, and when applicable EoL resistors.
    - a. Install wiring to supervisory devices and associated EoL resistors as required for supervision of hardwired connections
  2. Install Wall-Mounted Equipment: Assemble component hardware within (e.g., card bays, sub-bays, expansion bays, signal cards, other card frames, networking, signal transmission, application modules, tamper monitoring devices, interconnecting modules, and auxiliary power supplies), including space for required spare capacity, and configure settings.
  3. Install Interconnect Wiring: Connect system cabinets, install processor and cards, cabling, connectors, terminations, and bonding.
- F. Branch Power:
1. After installation confirmations, follow manufacturer instructions to connect branch circuit power cables to premises fire alarm system components; comply with NFPA 70.
  2. Where accessories require auxiliary power, provide control power source and monitoring as indicated or as required to complete installation.
  3. Install auxiliary power supplies, including indicated monitoring, and connections necessary for remote equipment.
- G. System Identification:
1. Identify devices, notification appliances, components, cables, and equipment in accordance with approved submittals. See Section 260553.
  2. Confirm fire alarm system programming meets requirements of SOO and sub-system SOOs.
  3. Mark location of disconnecting means for NPFLA circuits.

4. Coordinate to provide red branch power circuit protective devices or identify them accordingly as required by NFPA 72 and NFPA 70.
  5. Mark date of batteries installed on inside cover of panels and formal maintenance logs.
- H. Troubleshooting and Installer Checks:
1. Field test connectivity periodically during installation process to avoid unexpected troubleshooting.
  2. Check system operation for notification, FACU functions, circuit supervision, alarm initiating devices, supervisory initiating devices, dress panels/doors/covers, and programming before performing field tests.
- I. Fire Alarm System Tests:
1. Perform required tests of NFPA 72. Record measured values during operational checks.
  2. Confirm functional testing of fire alarm system is as indicated in Contract Documents.

### **3.04 FIELD QUALITY CONTROL**

- A. Provide services of manufacturer's authorized representation to observe installation and assist in inspection, testing, and adjusting. Include manufacturer's detailed testing procedures and field reports and with submittals.
- B. Provide equipment, two-way radios for testing personnel use, tools, and supplies required to accomplish inspection and testing.
- C. Notify Owner and Architect at least two weeks prior to scheduled inspections and tests.
- D. Inspect and test in accordance with manufacturer's instructions.
- E. Inspect wiring and components for damage and defects.
- F. Batteries and Power Supplies: Perform inspections and tests listed in manufacturer installation instructions.
- G. Perform additional requirements related to testing and inspection during system startup.
- H. Test for interface with other systems.
- I. Test shunt trips to verify operation.
- J. Correct defective work, adjust for operation, and retest until entire system complies with Contract Documents.
- K. Submit detailed reports indicated inspection and testing results, corrective actions taken, and as-found and final adjusted settings.

### **3.05 SYSTEM STARTUP**

- A. Obtain Owner approval prior to performing system startup.

**3.06 ADJUSTING**

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.
- B. Adjust initiating device and notification appliance settings to achieve desired operation as indicated in submittals.
- C. Measure power supply primary and secondary voltages, log values for records, and make appropriate adjustments.
- D. Adjust alignment of equipment covers and doors. Provide keys and spare keys to Owner.
- E. Reprint and reinstall damaged or misinstalled labels; maintain neat and square to installed location good workmanship - see NECA 1; maintain consistent placements for identification on products of similar type.
- F. Adjust devices or notification appliances and associated bases to be flush and level.
- G. Program system parameters according to requirements of Owner.

**3.07 CLEANING**

- A. Check tightness of electrical connections. Replace damaged components and provide closure plates for vacant positions. Provide circuit directory updates for related power branch circuits.
- B. Clean and repair existing materials and equipment that remain or are indicated for reuse.
- C. Clean dirt, debris, plaster, and other foreign materials from outlet boxes and fire alarm system equipment and components.
- D. Clean fire alarm system equipment and components according to manufacturer's instructions and NECA 305.
- E. Clean surfaces and interiors of boxes and device cover plates in accordance with manufacturer's instructions to remove dirt, fingerprints, debris, plaster, and other foreign materials.
- F. Repair scratched or marred exposed surfaces to match original factory finish.
- G. Comply with federal (EPA), state, and local regulations for battery handling and disposal. Do not spill battery fluids down plumbing drains. Only use containers safe for transportation marked 'nonspillable.'

**3.08 COMMISSIONING**

- A. Comply with NFPA 3 for commissioning of fire protection and life safety systems.
- B. Comply with NECA 90 for commissioning building electrical systems.
- C. Support Commissioning Agent in assembling test data and generating reports.
- D. Participate in four hours of seasonal testing, as scheduled by Commissioning Agent, six months from Date of Substantial Completion.

### 3.09 INSPECTION AND TESTING FOR COMPLETION

- A. Notify Owner 7 days prior to beginning completion inspections and tests.
- B. Notify AHJ and comply with their requirements for scheduling inspections and tests and for observation by their personnel.
- C. Provide services of installer's supervisor or person with equivalent qualifications to supervise inspection and testing, correction, and adjustments.
- D. Prepare for testing by ensuring that work is complete and correct; perform preliminary tests as required.
- E. Provide tools, software, and supplies required to accomplish inspection, testing, and document results.
- F. Perform inspection and testing in accordance with NFPA 72 and requirements of AHJ; document each inspection and test.
- G. Correct defective work, adjust for operation, and retest until entire system complies with Contract Documents.

### 3.10 OWNER PERSONNEL INSTRUCTION

- A. Provide the following instruction to designated Owner personnel:
  - 1. Hands-On Instruction: On-site, using operational system.
  - 2. Classroom Instruction: Owner furnished classroom, on-site or at other local facility.
- B. Administrative: One-hour session(s) covering issues necessary for nontechnical administrative staff; classroom:
  - 1. Initial Training: One session precloseout.
- C. Basic Operation: One-hour sessions for attendant personnel, security officers, and engineering staff; combination of classroom and hands-on:
  - 1. Initial Training: One session precloseout.
- D. Use operation and maintenance documentation as primary instruction material; have paper copies available for attendees and supplement training material aids.

### 3.11 CLOSEOUT ACTIVITIES

- A. Closeout Demonstration: Demonstrate operation of all functions to Owner.
  - 1. Be prepared to conduct any of required tests.
  - 2. Have minimum one copy of operation and maintenance data, preliminary copy of project record drawings, input/output matrix, and operator instruction chart(s) available during demonstration.
  - 3. Have authorized technical representative of FACU manufacturer present during demonstration.
  - 4. Demonstration may be combined with inspection and testing required by AHJ; notify AHJ with enough time to schedule demonstration.
  - 5. Repeat demonstration until successful.

**3.12 PROTECTION**

- A. Protect installed fire alarm system from subsequent construction operations.

**3.13 MAINTENANCE**

- A. Perform routine inspection, testing, and preventive maintenance required by NFPA 72, including:
  - 1. Maintenance of fire safety interface and supervisory devices connected to fire alarm system.
  - 2. Repairs required, unless due to improper use, accidents, or negligence beyond control of maintenance contractor.
  - 3. Record keeping required by NFPA 72 and AHJ.
- B. Provide trouble call-back service upon notification by Owner:
  - 1. Provide on-site response within two hours of notification.
  - 2. Include allowance for call-back service during normal working hours at no extra cost to Owner.
  - 3. Owner will pay for call-back service outside of normal working hours on hourly basis, based on actual time spent at site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.
- C. Provide complete description of preventive maintenance, systematic examination, adjustment, cleaning, inspection, and testing, with detailed schedule.
- D. Maintain on-site log listing date and time of each inspection and call-back visit, condition of system, nature of trouble, correction performed, and parts replaced. Submit duplicate of each log entry to Owner's representative upon completion of site visit.
- E. Comply with Owner's requirements for access to facility and security.

**END OF SECTION**

**SECTION 284614**  
**SINGLE AND MULTIPLE STATION ALARMS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Single- and multiple-station alarms.

**1.02 RELATED REQUIREMENTS**

- A. Section 078400 - Firestopping.
- B. Section 260526 - Grounding and Bonding for Electrical Systems.
- C. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- D. Section 284600 - Fire Detection and Alarm: Fire alarm system.

**1.03 REFERENCE STANDARDS**

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- C. NFPA 72 - National Fire Alarm and Signaling Code; Most Recent Edition Cited by Referring Code or Reference Standard.
- D. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. UL 2034 - Standard for Single and Multiple Station Carbon Monoxide Alarms; Current Edition, Including All Revisions.

**1.04 SUBMITTALS**

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for products, including ratings, configurations, standard wiring diagrams, dimensions, finishes, service condition requirements, and installed features.

**1.05 QUALITY ASSURANCE**

- A. Comply with the following:
  - 1. NFPA 70.
  - 2. NFPA 72.
  - 3. Requirements of authorities having jurisdiction.
  - 4. Applicable local codes.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.
- B. Store products in manufacturer's unopened packaging, keep dry and protect from damage until ready for installation.

**1.07 FIELD CONDITIONS**

- A. Maintain field conditions within required service conditions during and after installation.

**1.08 WARRANTY**

- A. Manufacturer Warranty: Provide 10-year manufacturer warranty for alarm units. Complete forms in Owner's name and register with manufacturer.

**PART 2 PRODUCTS****2.01 MANUFACTURERS**

- A. Resideo Technologies, Inc; First Alert: [www.resideo.com/#sle](http://www.resideo.com/#sle).

**2.02 SINGLE- AND MULTIPLE-STATION ALARMS**

- A. General Requirements:
  - 1. Power Supply: 120 VAC with battery backup, alkaline or sealed lithium with 10-year life. Battery-operated only alarms not permitted.
  - 2. Utilize plug-in mounting with tamper-resistant features.
  - 3. Provide alarm test and silence features.
  - 4. Self restoring; automatic alarm reset upon clearing of alarm condition.
  - 5. Multiple-Station Alarms:
    - a. Utilize wired communication between interconnected alarms.
    - b. Limit number of interconnected alarms in accordance with manufacturer's requirements and applicable codes.
- B. Carbon Monoxide Alarms:
  - 1. Listed and labeled as complying with UL 2034.
  - 2. Provide end-of-life notification.
- C. Combination and Multicriteria Alarms: Comply with respective requirements for each detection method.

**2.03 ACCESSORIES**

- A. Relay Modules:
  - 1. Provide as required to activate external auxiliary devices.
  - 2. Listed as accessory for use with connected alarms.
  - 3. Activate relay contacts when alarm sounds, and deactivate after alarm stops sounding.
  - 4. Contacts: Form C, one normally open and one normally closed.
  - 5. Voltage: 120 VAC.

**PART 3 EXECUTION****3.01 INSTALLATION**

- A. Comply with NECA 1 for general workmanship.
- B. Install products in accordance with manufacturer's instructions.

- C. Install new batteries in devices with field-installed battery backup.
- D. Provide grounding and bonding; see Section 260526.
- E. Install firestopping to preserve fire resistance rating of partitions and other elements; see Section 078400.
- F. Identify system wiring, components, and overcurrent protective devices for branch circuits serving alarms; see Section 260553.

### **3.02 FIELD QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements for additional requirements.
- B. Comply with requirements of authorities having jurisdiction for scheduling and observation of inspections and tests.
- C. Perform initial acceptance inspection and testing in accordance with NFPA 72 and requirements of authorities having jurisdiction; document each inspection and test.
- D. Use integral test feature to confirm operation of each alarm and activation of interconnected alarms.
- E. Correct deficiencies and replace damaged or defective alarms and accessories.

### **3.03 PROTECTION**

- A. Protect installed alarms from subsequent construction operations.

**END OF SECTION**

**SECTION 32 13 13 CONCRETE PAVING****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

**1.2 SUMMARY**

- A. Section Includes:
  - 1. Frost Slabs
  - 2. Concrete Side Walks.
- B. Section Includes:
  - 1. Cold-applied joint sealants.

**PART 2 - PRODUCTS****2.1 STEEL REINFORCEMENT**

- A. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, fabricated from as-drawn steel wire into flat sheets.
- B. Deformed-Steel Welded Wire Reinforcement: ASTM A 497/A 497M, flat sheet.
- C. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420); deformed.
- D. Plain-Steel Wire: ASTM A 82/A 82M, as drawn.
- E. Deformed-Steel Wire: ASTM A 496/A 496M.
- F. Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420) plain-steel bars; zinc coated (galvanized) after fabrication according to ASTM A 767/A 767M, Class I coating. Cut bars true to length with ends square and free of burrs.
- G. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified.

**2.2 CONCRETE MATERIALS**

- A. Cementitious Material: Use the following cementitious materials, of same type, brand, and source throughout Project:
  - 1. Portland Cement: ASTM C 150, white portland cement Type I or Type II.
    - a. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- B. Normal-Weight Aggregates: ASTM C 33, Class 4M, uniformly graded. Provide aggregates from a single source.
- C. Water: Potable and complying with ASTM C 94/C 94M.
- D. Air-Entraining Admixture: ASTM C 260.
- E. Chemical Admixtures: Admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.

**2.3 CURING MATERIALS**

- A. Clear BASF Sonneborn, "Kure-N-Seal" Curing Compound: Apply 2 coats. ASTM C 309, Type 1, Class B, dissipating.

**2.4 COLD-APPLIED JOINT SEALANTS**

- A. One-component, Elastomeric, Gun-Grade Polyurethane Sealant for Concrete: High-performance, chemically curing elastomeric formulation complying with the following requirements for formulation and with ASTM C 920 for type, grade, class, and uses indicated:
  - 1. Polyurethane Formulation: Type S; Grade NS; Class 25; Uses NT, M, A, G and I, as applicable to joint substrates indicated.
    - a. Products:
    - b. Sonolastic NP 1, BASF, Sonneborn.

**2.5 JOINT-SEALANT BACKER MATERIALS**

- A. Expansion-Joint Filler Strips: Polyethylene closed-cell backing for sealants.
- B. Isolation- and Control -Joint Filler Strips: Closed -cell Backer-Rod and Soft Backer-Rod. ASTM C 1330, Type B and C.

**2.6 RELATED MATERIALS**

- A. Expansion-Joint Filler Strips: Polyethylene closed-cell backing for Sonolastic Sealants.
- B. Isolation- and Control -Joint Filler Strips: Closed -cell Backer-Rod and Soft Backer-Rod. ASTM C 1330, Type B and C.

**2.7 CONCRETE MIXTURES**

- A. Prepare design mixtures, proportioned according to ACI 301 (ACI 301M), with the following properties:
  - 1. Compressive Strength (28 Days): 4000 psi (27.6 MPa).
  - 2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.45.
  - 3. Slump Limit: 4 inches (100 mm), plus or minus 1 inch (25 mm).
  - 4. Air Content: 6 percent plus or minus 1.5 percent.
- B. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.

**PART 3 - EXECUTION****3.1 EXAMINATION AND PREPARATION**

- A. Remove loose material from compacted subbase surface immediately before placing concrete.

**3.2 EDGE FORMS AND SCREED CONSTRUCTION**

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.
- B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

**3.3 STEEL REINFORCEMENT**

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

### 3.4 JOINTS

- A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.
- B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.
- C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.
- D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, to match jointing of existing adjacent concrete paving:
- E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/4-inch (6-mm) radius. Repeat tooling of edges after applying surface finishes. Eliminate edging-tool marks on concrete surfaces.

### 3.5 CONCRETE PLACEMENT

- A. Moisten subbase to provide a uniform dampened condition at time concrete is placed.
- B. Comply with ACI 301 (ACI 301M) requirements for measuring, mixing, transporting, placing, and consolidating concrete.
- C. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- D. Screed paving surface with a straightedge and strike off.
- E. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

### 3.6 FLOAT FINISHING

- A. General: Do not add water to concrete surfaces during finishing operations.

- B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.
  - 1. Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.

### 3.7 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
- B. Comply with ACI 306.1 for cold-weather protection.
- C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete but before float finishing.
- D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- E. Curing Methods: Cure concrete by curing compound.

### 3.8 PAVING TOLERANCES

- A. Comply with tolerances in ACI 117 and as follows:
  - 1. Elevation: 3/4 inch (19 mm).
  - 2. Thickness: Plus 3/8 inch (10 mm), minus 1/4 inch (6 mm).
  - 3. Surface: Gap below 10-foot- (3-m-) long, unlevelled straightedge not to exceed 1/2 inch (13 mm).
  - 4. Joint Spacing: 3 inches (75 mm).
  - 5. Contraction Joint Depth: Plus 1/4 inch (6 mm), no minus.
  - 6. Joint Width: Plus 1/8 inch (3 mm), no minus.

### 3.9 PAVEMENT MARKING

- A. Allow concrete paving to cure for a minimum of 28 days and be dry before starting pavement marking.
- B. Sweep and clean surface to eliminate loose material and dust.

- C. Apply paint with mechanical equipment to produce markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils (0.4 mm).

### **3.10 JOINT INSTALLATION**

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.
- B. Joint-Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Clean off excess joint 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.

### **3.11 REPAIRS AND PROTECTION**

- A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect.
- B. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.
- C. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

**END OF SECTION 32 13 13**