



## **PROJECT MANUAL**

### **Lee's Summit, MO**

3501 SW Market St.

**Property Number: 160085**  
**BSRO Project Number: 906903**  
**SGA Project Number: 1955B71**

**March 26, 2020**

For  
**GBT Realty Corporation**  
9010 Overlook Blvd.  
Brentwood, TN 37027

Architect of Record:  
SGA Design Group, P.C.  
1437 S. Boulder Ave., Suite 550  
Tulsa, Oklahoma 74119  
(918) 587- 8600



DOCUMENT 000107 - SEALS PAGE  
PROJECT:

Name: Bridgestone Retail Operations, LLC (BSRO)  
Location: 3501 SW Market St., Lee's Summit, MO  
BSRO Project Number: 906983  
SGA Project Number: 1955B71

ARCHITECT OF RECORD

SGA Design Group, P.C.  
Mitchel Ray Garrett, Architect, #A-007541  
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Tulsa, OK 74119



03/26/2020  
\_\_\_\_\_  
Architect of Record                      Date

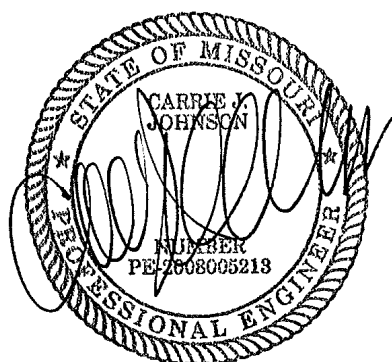




SEALS PAGE (Continued)

STRUCTURAL ENGINEER OF RECORD

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Structural Engineer of Record

Date



DOCUMENT 000107 - SEALS PAGE  
PROJECT:

Name: Bridgestone Retail Operations, LLC (BSRO)  
Location: 3544 SW Market St., Lee's Summit, MO  
BSRO Project Number: 906983  
SGA Project Number: 1955B71

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St. Louis, MO 63146



\_\_\_\_\_  
Fire Sprinkler Engineer of Record    Date

END OF SECTION 000107



DOCUMENT 000107 - SEALS PAGE  
PROJECT:

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Location: 3544 SW Market St., Lee's Summit, MO  
BSRO Project Number: 906983  
SGA Project Number: 1955B71

MECHANICAL ENGINEER OF RECORD

Randall A. Nelson  
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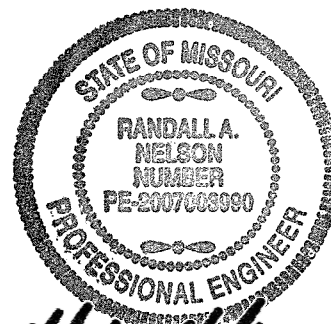
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Mechanical Engineer of Record

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Date

ELECTRICAL ENGINEER OF RECORD

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*Randall A. Nelson*

Electrical Engineer of Record

03/19/20  
Date



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Location: 3544 SW Market St., Lee's Summit, MO  
BSRO Project Number: 906983  
SGA Project Number: 1955B71


**FIRE PROTECTION  
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**FIRE ALARM ENGINEER OF RECORD**

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St. Louis, MO 63146

<sup>2020-03-25</sup>  
\_\_\_\_\_  
Fire Alarm Engineer of Record      Date

END OF SECTION 000107





DOCUMENT 000107 - SEALS PAGE  
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Location: 3544 SW Market St., Lee's Summit, MO  
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SGA Project Number: 1955B71


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ENGINEER OF RECORD:**

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NO. 000419



**INTRUSION ALARM ENGINEER OF RECORD**

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 2020-03-25  
\_\_\_\_\_  
Intrusion Alarm Engineer of Record      Date

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## SECTION 010000 – GENERAL REQUIREMENTS

## PART 1 - GENERAL

## 1.1 GENERAL

- A. Contractor and all Subcontractors are directed and required to read the entire project manual and Standard General Conditions included herein in order to familiarize themselves with all items related to their individual crafts.
- B. Contractor shall keep one complete up-to-date set of Drawings and Specifications on the job at all times, including all voided sheets for ready reference in addition to other copies of Drawings and Specifications used by mechanics on actual construction work.

## 1.2 DEFINITIONS

- A. Wherever the words "Owner and Contractor" are used in this Project Manual, it refers to those entities as defined on the Contract Form.

## 1.3 TERMS INCLUDED

- A. Any item or construction detail not shown on the Drawings but called for in the Specifications and any item or construction detail shown on the Drawings and not mentioned in the Specifications are a part of this contract just as much as if they are shown and mentioned on both Drawings and Specifications

## 1.4 CHANGES

- A. Any changes or additions to the Contract, Drawings or Specifications shall be in writing on Owner's "Change Order" form. Contractor and all Subcontractors are hereby given notice that no extras will be recognized unless they are authorized in writing on said form by Owner's Field Representative.

## 1.5 DISCREPANCIES, CONTRADICTIONS, AND AMBIGUITIES

- A. Any discrepancies, contradictions or ambiguities on the Drawings and/or specifications or between the Drawings and specifications shall be called to the Owner's attention at time of submitting bid and before awarding of contract. If this procedure is not followed, the Owner reserves the right to rule on any discrepancies, contradictions or ambiguities in the Drawings and Specifications after awarding of contract and Owner's decision shall be final. Contractor shall have no claim for extra compensation because of decision.
- B. No extra charge will be allowed on account of differences between actual dimensions and measurements indicated on Drawings. Differences which may be found shall be submitted to Owner for his consideration before proceeding with the work.

## 1.6 CODES

- A. Contractor shall submit his base bid in accordance with Drawings and Specifications. If Drawings and Specifications do not comply with any codes or utility company requirements having jurisdiction, then Contractor shall submit an alternate price on any changes necessary to comply with such codes. If such alternates are not stated in bid, it shall be assumed that Contractor's base bid includes all work necessary to comply with such codes or utility company regulations. No extras shall be paid for any work required for complying with such codes or for replacing work and materials in order to meet requirements of codes or utility company regulations having jurisdiction.
- B. If Drawings and Specifications call for an installation with requirements in excess of the minimum code requirements, the installation shall be made strictly in accordance with the Drawings and Specifications.

## 1.7 INSPECTION OF WORK

- A. Contractor shall provide and keep on job a safety helmet for use of authorized representatives.
- B. In the event the specifications, laws, ordinances, or any public authority requires any part of work or materials to be specially tested or installation specially supervised, such testing and supervision shall be at Contractor's expense. Owner shall be notified in writing of time, date and place fixed for such testing and supervision

## 1.8 CONTRACTOR REQUIREMENTS

- A. Attention is called to the Contractor that he shall provide a competent superintendent and any necessary assistants (all satisfactory to owner) in order to provide strict supervision over all Subcontractors. He shall familiarize himself with those portions of the Specifications and Drawings pertaining to the Subcontractors. The Contractor shall see that each of the Subcontractors under this Contract fully and faithfully completes all work in strict accordance with the provisions as set forth in the Drawings and Specifications as they pertain to those Subcontractors. General Contractor shall be held responsible for the failure of any of his Subcontractors to complete all the work in accordance with the Drawings and Specifications.
- B. The Contractor shall have the superintendent stay on the job site for up to 30 days following substantial completion, or until the Construction Manager states otherwise.
- C. Should the Contractor object to methods or materials specified, he shall notify Owner in writing and have same adjusted before proceeding with the work. Procedure without notice shall be construed as full acceptance of the Drawings and Specifications.

## 1.9 SUBCONTRACTS

- A. General Contractor shall be held responsible for all material or labor furnished by Subcontractors. Owner reserves the right to accept or reject any Subcontractors and Contractor shall obtain Owner's approval before letting any Subcontracts or placing orders for materials.
- B. Subcontractor certification shall be required for hoist and "Firestone Rubber guard" roof installations.



#### 1.10 COOPERATION WITH OTHER CONTRACTORS

- A. Contractor shall collaborate with any Subcontractor for building of recess, openings, etc. or leaving holes as required by other Contractors. If proper notice and instructions are not given to Contractor prior to the erection of such work, Subcontractor shall then employ Contractor to do the work required for them at Subcontractor's expense

#### 1.11 ACCEPTANCE OF OTHER CONTRACTOR'S WORK

- A. If any part of the Contractor's work depends for proper execution or results upon the work of any other Contractor, the Contractor shall inspect and promptly report to Owner any defects in such work that render it unsuitable for such proper execution and results. His failure to inspect and report shall constitute an acceptance of the other Contractor's work as fit and proper for the reception of his work, except as to defects which may develop in the other Contractor's work after the execution of his work.

#### 1.12 MATERIALS FURNISHED BY BSRO

- A. Contractor shall refer to Section 016400 of these Specifications for materials to be furnished by BSRO and installed by Contractor. Those materials will be supplied by BSRO, F.O.B. job site and shall be stored by Contractor (see paragraph immediately below) and installed by Contractor or respective Subcontractor. In the absence of any notes or statements on Drawings, or in specifications, to the effect that various materials to complete job are to be furnished by BSRO, they shall be furnished by Contractor.

#### 1.13

#### 1.14 SUBCONTRACT PAYMENTS

- A. Contractor shall promptly pay each subcontractor for such portion of Work that such subcontractor is entitled.
- B. Contractor shall, by appropriate agreement with each subcontractor, require each subcontractor to promptly pay each sub-subcontractor.
- C. Contractor, subcontractors, sub-subcontractors, and suppliers shall not use "Pay When Paid" clauses or contracts.
- D. Owner reserves the right to require all sums due under the Contract Documents to be paid pursuant to a joint check arrangement or through a construction escrow account. Contractor agrees to sign such documents as required for this purpose.

#### 1.15 MANUFACTURER'S WARRANTIES

- A. Manufacturer's warranties on installed equipment and other building items, as well as Subcontractor and supplier warranties and guarantees, express or implied, respecting any part of the work and any materials used therein shall be deemed obtained and shall be enforced--by the Contractor as the agent for the benefit of the owner.

- B. Contractor shall furnish copies of the warranties of the equipment or building items where such warranties have been issued by Manufacturer.

#### 1.16 CONTROLLED MATERIALS

- A. Where materials are required by the Governing Building Codes to be certified by an accredited authoritative agency as meeting accepted engineering standards for quality, the certification shall be furnished by the Contractor.

#### 1.17 SCHEDULES & ESTIMATES

- A. Immediately after execution and delivery of the contract, the Contractor shall deliver to the Owner a "Building Progress Schedule" showing the proposed dates of commencement and completion of each of the various sub-divisions of work required under this project. Contractor shall keep schedule updated at least bi-weekly.
- B. Within twenty (20) days after execution of Contract, Contractor shall name all Subcontractors and material dealers from whom materials will be purchased for this project.
- C. In the case that work is not completed within the allotted time frame the Contractor will be responsible for Liquidated Damages.
- D. He shall submit a breakdown (Schedule of Values) of the contract price, by trade, to the Owner on the Schedule of Value form. This "Schedule of Values" when approved by Owner shall be the basis of computing monthly estimates of work completed on the project.
- E. Include the scheduled delivery of BSRO furnished products in the Proposed and Approved Project Schedules. Items to be included are listed in the BSRO Furnished Products Schedule at the end of this Section and may also include additional items listed on Drawings. These delivery times are critical and must be achieved on the scheduled date.
- F. Fixture equipment deliveries of BSRO furnished products will only be phased according to the approved Milestone Schedule. BSRO furnished products will be released from the warehouse only at the request of Owner's Construction Manager.

#### 1.18 SHOP DRAWINGS

- A. Contractor shall submit with such promptness as to cause no delay in his own work or in that of any other Contractor, three copies of all shop or setting drawings and schedules required for the work of the various trades. Owner shall waive the requirement of all shop drawing submittals when Contractor intends to supply materials exactly matching the drawings and specifications with the exception of the submittals required by Section 013000. Contractor must submit shop drawings for all proposed "equal" substitution products. Owner shall pass upon submitted drawings with reasonable promptness making desired corrections, including all necessary corrections relating to artistic effect. Contractor shall make all corrections required by Owner, file with him two corrected copies and furnish such other copies as may be needed. Owner's approval of such drawings or schedules shall not relieve Contractor from responsibility for deviations from drawings or specifications, unless he had in writing called Owner's attention to such deviations at the time of submission, nor shall it relieve him from responsibility for errors of any sort in shop drawings or schedule.

1.19

## 1.20 MODEL ENERGY EFFICIENCY CODE REQUIREMENTS

- A. When required, Contractor shall obtain and submit the fully executed Energy Efficiency-Forms and Calculations to the governing authorities having jurisdiction. Contractor shall furnish Owner with a copy of the executed form and calculations. All fees pertaining to the above shall be paid by the Contractor.

## 1.21 SCHEDULING

- A. The construction shall be completed in the calendar days noted in the Invitation to Bid, INCLUDING average weather days, with the actual dates adjusted by the issuance of the Notice to Proceed. Liquidated Damages may be assessed for each day after the Substantial Completion day that the project is not complete. Refer to the Construction Contract and General Conditions for further details.
- B. No revision to the project schedule shall constitute a revision to the Contract time, milestone dates, substantial or final completion dates, or any Contract documents. In the event that the work in accordance with the project schedule is not maintained in a manner which allows completion within the Contract time frame, the General Contractor shall at its expense employ additional personnel including overtime labor which in Bridgestone Retail Operations LLC's opinion is necessary to allow the work to be completed within the Contract time.

## PART 2 - PRODUCTS

## 2.1 MATERIALS AND SUBSTITUTIONS

- A. Wherever any particular brand of material is specified, either on Drawings or Specifications, the same is to be regarded as a standard. If any other article of equal merit is proposed by Contractor, he must obtain owner's prior approval in writing. Where specifications list several Manufacturers of like materials, only those Manufacturer's products are acceptable. If Contractor desires to use any other, written approval shall be obtained from Owner before accepting quotations or Purchasing materials manufactured by firms not specified. If Contractor purchases materials manufactured or fabricated by firms that are not listed in specifications, they do so at their own risk. No item other than specified will be considered if brought to site without previous written permission. All materials of special make where called for shall be furnished with all accessories necessary for proper installation as per Manufacturer's recommendations and specifications.

## 2.2 MATERIALS AND WORKMANSHIP

- A. Unless otherwise specifically provided by contract, change order or herein, all materials shall be new. Both workmanship and materials shall be of the best quality for their respective trades. Each Contractor shall be responsible for the satisfactory completion of all work under contract to him.

- B. In addition, each Contractor shall provide, without extra charge, all incidental items required as a part of the work or required in order that various portions of building are completed in accordance with good construction and engineering practice. These are to be provided even though such items may not be specifically described or indicated but are necessary to complete properly the installation of the work. Each Contractor shall submit, without extra charge, evidence (satisfactory to Owner) that each item of material furnished under his contract fulfills the requirements of the specifications for such materials.
- C. It is the Owner's intent that wherever possible, the Contractor shall select materials that have a recycled content or are available from a regional source.
- D. Should at any time improper, imperfect, or unsound material or faulty workmanship be observed, whether before or after the same shall have been brought into the structure, the Contractor shall, upon notice from the Owner, cause the same to be removed and good and proper material or work substituted therefore without delay. In the event the Contractor defaults in promptly handling the foregoing and after receipt of written notice by Owner of such default, Owner may resort to such other means as may be deemed necessary to correct such imperfections as described above. The cost of correcting these imperfections or such alterations shall be charged to the Contractor and the amount therefore deducted from the sum due to or recoverable from him under this contract.
- E. If Owner deems it inexpedient to correct work injured or work done not in accordance with Drawings, Specifications and contract, an equitable deduction from the contract price or refund to Owner shall be made, therefore.
- F. The Contractor shall be fully responsible for the safety and good condition of all work and materials in his contract until the completion of his contract as an entirety. In addition, Contractor shall be responsible for fulfilling his obligation of providing all materials and executing all work in strict accordance with drawings and specifications for a period of one year from date of completion of project.

### PART 3 - EXECUTION

#### 3.1 MOBILIZATION

- A. Mobilization shall be complete within seven days of Contract Award. The following shall be complete:
  - 1. Office trailer installed on site.
  - 2. Erosion control devices installed.
  - 3. Construction entrance installed.
  - 4. Portable toilet on site.
  - 5. Clearing and grubbing underway.

#### 3.2 STORAGE SHED

- A. Contractor shall provide shed for safe storage of such material as may be damaged by weather including materials furnished by BSRO. Contractor shall keep shed in good repair and when it is no longer needed remove from site.

#### 3.3 SHORING AND BRACING

- A. Contractor shall provide all permanent and temporary bracing, shoring, and anchoring that the nature of his work may require in order to make everything absolutely stable and secure even where

such bracing, shoring, and anchoring are not explicitly called for. Contractor will be held strictly accountable for any damage or injury resulting from judgment or for any other cause.

- B. Contractor shall do all underpinning or shoring that may be necessary to properly execute the work or for protection of adjoining property under local code or law.

### 3.4 PROTECTION AGAINST INJURY OR DAMAGE

- A. Contractor shall protect from damage the work finished and furnished by him or others. He shall protect if from loss resulting from carelessness, the elements or any other causes, except for damage by perils covered by the usual fire and extended coverage risk assumed by the Owner. He shall protect the entire work until it is completed and accepted by Owner. Owner will not carry individual policies at different sites as owner is self-insured and will assume the following risk: In case the building or building materials shall be destroyed, in whole or in part, by any of the perils covered under the fire and extended coverage insurance on the usual standard form of insurance policy in use in the state within which the site is situated, Owner shall cover damages. Normal perils that are covered include fire, Acts of God, vandalism, and malicious mischief. Theft and collapse are not covered.
- B. Contractor shall replace any part of the work which is damaged as described above prior to the time the entire work is completed and accepted by Owner. Contractor shall also protect and hold Owner harmless from any damage to adjacent property arising out of the performance of this Contract.

### 3.5 CONTRACTOR'S ONE-YEAR WARRANTY

- A. Contractor shall repair any problems arising covered by the one-year warranty period as described in Section 017700.
- B. Repairs shall be made within 24-hours from time of call. Owner retains the right to have repairs made by a third-party which are not made within the 24-hour time period. Contractor shall reimburse Owner for such repairs, or amount will be deducted from Contractor's payment.
- C. Contractor shall make subcontractors aware of this requirement for repairs.

END OF SECTION 010000



## SECTION 011000 - SUMMARY

## PART 1 - GENERAL

## 1.1 SUMMARY

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

## 1.2 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of Project is defined by the Contract Documents and comprises the general construction required for a new Bridgestone store.

## 1.3 DEFINITIONS

- A. Furnish: Purchase and deliver to project site, ready for installation.
- B. Install: Unpack, assemble, set in final position, fasten in place, make final connections, clean, adjust, and leave ready for use.
- C. Provide: Furnish and install.
- D. Receive: Accepting a delivery. (Entity responsible for accepting a delivery.)
- E. Final Connections: Complete plumbing, mechanical, and electrical connections as required and recommended by Manufacturer for optimum operation of equipment.

## 1.4 WORK UNDER SEPARATE CONTRACTS

- A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract or other contracts. Coordinate the Work of this Contract with work performed under separate contracts.

## 1.5 ACCESS TO SITE

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

## 1.6 WORK RESTRICTIONS

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

## SUMMARY

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

#### 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.
  3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000



## SECTION 013000 – ADMINISTRATIVE REQUIREMENTS

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section includes:
  - 1. Pre-construction meeting.
  - 2. Progress meetings.
  - 3. Construction progress schedule.

## PART 2 - PRODUCTS

NOT USED

## PART 3 - EXECUTION

## 3.1 PRE-CONSTRUCTION MEETING

- A. Owner's Representative will schedule a meeting after Notice of Award.
- B. Agenda:
  - 1. Execution of Owner-Contractor Agreement.
  - 2. Submission of executed bonds and insurance certificates.
  - 3. Distribution of Contract Documents.
  - 4. Submission of list of Subcontractors, list of products, schedule of values, and progress schedule.
  - 5. Designation of personnel representing the parties in Contract, and the Owner's Representative.
  - 6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
  - 7. Scheduling.
- C. The Contractor shall record the minutes and distribute copies within two days after meeting to participants, to Owner's Representative, and to those affected by decisions made.

## 3.2 PROGRESS REPORTS

- A. Submit a weekly construction progress report each Friday from start of construction to store opening.

## 3.3 PROGRESS CALLS

- A. Participate in a weekly construction progress call led by Owner's Construction Manager. Be prepared to discuss the following:
  - 1. Upcoming schedule.
  - 2. Pending Requests for Information (RFI's).
  - 3. Possible change orders.
  - 4. Upcoming BSRO furnished product deliveries.

END OF SECTION 013000

## SECTION 013233 – PHOTOGRAPHIC DOCUMENTATION

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Related Requirements:
  - 1. Section 017700 – Closeout Procedures: Final closeout submittals.

## 1.2 SUMMARY

- A. Section includes an integrated, professional-grade, high resolution digital webcam system designed specifically for the construction industry as a turnkey package including camera and related hardware, mounting equipment, software, wireless cellular data transmission service, website hosting, image hosting and storage, online interface for the system and technical support.

## 1.3 USE CHARGES

- A. Contractor shall maintain an active contract for System Service for duration of Contract Time unless other term is agreed upon in writing by the Owner. Cost for System Service shall be included in the Contract Sum, with a cost allowance not to exceed \$6,000.
  - 1. Include in the Contract Sum, the cost of alternative electrical power supply for use until the local utility can provide a temporary power pole.

## 1.4 DEFINITIONS

- A. System Vendor: Provider of megapixel camera (4mp) system hardware and software and host maintaining off-site server, data storage devices, and troubleshooting software and equipment.
- B. System Service: Host services provided by System Vendor including image acquisition, transfer, backup, periodic upgrades to the system, viewing access via a maintained interface on the Internet and on-line storage of images for duration of the Service Contract.

## 1.5 COORDINATION

- A. Coordinate layout and installation of camera to avoid interference from trees and to prevent sunlight and light from fixtures entering directly into the camera lens.

## 1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which Manufacturer agrees to repair or replace components of cameras and equipment related to camera operations that fail in materials or workmanship within specified construction period. Failures include, but are not limited to, the following:
  - 1. Failure of system to meet performance requirements.
  - 2. Faulty operation of hardware and software.
  - 3. Defects in other components of the work.

## 1.7 USAGE RIGHTS

- A. Contractor shall understand that photographs and archives generated by the camera system become the mutual property of the Owner and System Vendor and cannot be used for advertisement or publicity reasons without the expressed written consent of the Owner and System Vendor.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 1. OxBlue, Inc., Phone: (888) 849-2583, Website: [www.oxblue.com](http://www.oxblue.com).
- B. Substitutions: Comply with provisions of Section 016000, "Product Requirements."

### 2.2 SYSTEM REQUIREMENTS

- A. The indoor/outdoor camera system shall consist of a tamper and impact resistant, discreet, fixed pole-mount enclosure with integrated fixed camera, lens and controller.
- B. The cameras shall have the ability to take a high-resolution four (4) megapixel digital still images of the construction site every 15 minutes and upload the still images over a wireless cellular modem to a secure, password-protected website.

### 2.3 EQUIPMENT

- A. Camera: Integrated high definition camera and lens assembly consisting of a charge coupled device (CCD) camera with a remotely controlled focal length lens mounted as a permanent module with the following features:
  - 1. Digital Still Image Resolution: Minimum sensor size of 4.0 megapixels, and at an image resolution of not less than 2304 x 1728 pixels.
  - 2. Memory: Unlimited remote storage provided by the system vendor.
  - 3. Lens: 6.3 - 63 mm (38-380mm equivalent in 35mm photography), system capable of ten times (10x) optical zoom. Include a wide-angle conversion lens with a 0.66x factor. Provide capability to remotely control focal length lens to change resolution, focus and zoom.
  - 4. Focus Mode: iESP auto, Spot AF, Selective AF target, Manual.
  - 5. Metering Mode: Digital iESP multi-pattern auto TTL, Spot metering, Center Weighted metering.
  - 6. Data Connection: Provide one of the following:
    - a. In areas with cellular coverage, operate cameras via built-in cellular data connection provided and maintained by the system vendor.
    - b. In areas without cellular coverage, operate cameras via an RJ-45 Ethernet data connection over broadband or satellite internet access provided and maintained by the Contractor.
  - 7. Electrical Operation: 120 VAC at maximum 83 Watts.
- B. Camera Enclosure: Construct tamper and impact resistant housing of extruded aluminum, die cast aluminum, and sheet aluminum body with factory-applied powder coated finish.
  - 1. Construct with forward opening, front hinged lid, allowing easy access to camera mounting sled.
  - 2. Provide rear link-lock latch, manufactured from stainless steel, suitable for use with pad lock.
  - 3. Equip with heater, blower and thermostat.
  - 4. Size: 25-1/4 inches long by 6-7/8 inches wide by 5 inches high.

### 2.4 INTERFACE AND ONLINE ACCESS

- A. Remote Access: Contractor's System Vendor shall provide an online interface system to allow viewing of all high-definition digital still images captured and stored during construction, from any location with internet access and with password protection.
  - 1. Maintain images on the System Vendor's website for reference available at all times during construction and for not less than 90 days after Final Completion.
- B. Online Interface:
  - 1. The online interface system shall be accessible by an unlimited number of human users.
  - 2. System shall display Project name and Owner Logo.

3. The system shall display online time-lapse videos and allow for videos to be downloaded by users.
4. Navigation: Provide calendar-based navigation system for selecting specific images.
5. Zoom: Provide pan and zoom capability for zooming into high definition images.
6. User Screen Viewing Options:
  - a. Dynamic Calendar: Provide screen showing calendar in which each day displays an image for that day.
  - b. Project Dashboard: Provide screen allowing user to view multiple sites at one time.
  - c. Full-Screen: Provide screen maximizing view of images on users monitor.
7. Email: Provide capability to email photos with comments from within the system.
8. Slideshow: Provide capability to browse through images, moving forward and backward in time by individual image and by day.

### PART 3 - EXECUTION

#### 3.1 PREPARATION

- A. Prior to mobilization, contact OxBlue Corporation to provide BSRO specific construction camera services.
- B. Submit order for camera services immediately upon Notice of Award.
  1. Submit orders electronically at [www.oxblue.com/order](http://www.oxblue.com/order).
- C. Unpack camera system components and save packing materials (box and foam) for future shipment of camera system including associated appurtenances and mounting equipment to Owner or Manufacturer as required.

#### 3.2 INSTALLATION

- A. General:
  1. Install camera system in accordance with Manufacturer's printed instructions, State and Municipality codes and requirements and approved submittals.
  2. Install units plumb and at proper angle to provide maximum field of view of on-site operations.
  3. Securely and rigidly anchor products in place.
  4. Connect cameras to temporary power as required.
  5. Camera to be installed and operational by week 2 after breaking ground.
- B. Camera Positioning:
  1. Install camera so that field of view of approximately 77 degrees covers intended area of site.
  2. Install camera at elevation above roof height that will provide uncompromised visual coverage of two complete sides of the building.
  3. Install camera so that position of sun or manmade light sources will not come into direct contact with field of view of camera at any time during construction.
  4. Install camera to provide maximum site and building visibility.
- C. Relocate camera system 21 days prior to Owner Possession. Relocate to building interior to provide visibility throughout the service bay interior.
  1. Provide continuous camera service until Grand Opening.

#### 3.3 FIELD QUALITY CONTROL

- A. Pre-installation Testing: Test camera on site at ground level prior to mounting unit in its intended elevated position.
  1. Contact System Vendor not less than 24 hours in advance of installation for testing.
  2. Connect unit.
  3. After 30 minutes contact System Vendor and require System Vendor to remotely confirm camera is operating properly.

4. Install camera in approved location.

#### 3.4 OPERATION, TERMINATION, AND REMOVAL

- A. Maintenance: Maintain camera equipment in good operating condition on a 24-hour basis until removal.
- B. Termination and Removal: Remove camera system prior to Substantial Completion. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
  1. Camera system including associated appurtenances and mounting equipment are to be packaged together and sent back to Oxblue, Inc.

END OF SECTION 013233

## SECTION 013300 – SUBMITTAL &amp; RFI PROCEDURES

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals and RFIs.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

## 1.2 DEFINITIONS

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

## 1.3 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
  - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
  - 2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
    - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- B. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
  - 1. Initial Review: Allow 10 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
  - 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
  - 3. Resubmittal Review: Allow 10 days for review of each resubmittal.
  - 4. For the metal building/foundation/foundation reinforcing, GC to factor in a minimum of a 4-week lead time to when planning to pour footings to ensure enough time for coordination with metal building Manufacturer/Architect/Structural Engineer.
- C. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:

## SUBMITTAL PROCEDURES

1. Assemble complete submittal package into a single pdf file incorporating submittal requirements of a single Specification Section. Group all applicable submittals as noted below. All Plumbing Fixtures are to be combined into single PDF file, All Lighting are to be combined into single pdf file, etc.
  2. Name file with submittal number or other unique identifier, including revision identifier.
    - a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).
  3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
  4. Transmittal Form for Electronic Submittals: Use form located at end of this section, containing the following information:
- D. Options: Identify options requiring selection by Architect/Engineer.
- E. Deviations: Identify deviations from the Contract Documents on submittals.
- F. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1. Note date and content of previous submittal.
  2. Note date and content of revision in label or title block and clearly indicate extent of revision.
  3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.
- G. Distribution: Furnish copies of final submittals to Manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- H. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

## PART 2 - PRODUCTS

NOT USED

## PART 3 - EXECUTION

### 3.1 SUBMITTAL & RFI PROCEDURES

- A. Transmit each RFI and Shop Drawing with approved form located at the end of this section.
- B. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.
- C. Identify Project, Contractor, Subcontractor or Supplier, pertinent drawing and detail number, and specification section number, as appropriate on each copy.
- D. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents. If

## SUBMITTAL PROCEDURES



- E. Upload submittals to Architect. If there are any questions, contact Owner Construction Manager for assistance.
- F. Schedule submittals to expedite the Project, and coordinate submission of related items. Once the contract is awarded, it is the expectation by the Owner that that contractor begins submitting all required submittals. Do not wait till close to construction or concrete pour for example to submit necessary submittal.
- G. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.
- H. Identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of the completed Work.
- I. Provide space for Contractor and Owner's Representative review stamps.
- J. When revised for resubmission, identify all changes made since previous submission.
- K. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.

### 3.2 MANDATORY SUBMITTALS FOR REVIEW OR APPROVAL

- A. Shop Drawings and Information will be required as listed below:
  - 1. Concrete
    - a. 033000 Concrete Mortar Mix Designs
    - b. 033000 Anchor Bolt Details.
    - c. 033000 Reinforcing Steel in Concrete
  - 2. Masonry
    - a. 042200 Reinforcing Steel in Masonry
    - b. 042200 Masonry Mortar Mix Designs.
    - c. 042200 Masonry Units
  - 3. Steel
    - a. 051200 Structural Steel Framing
    - b. 052100 Steel Joist Framing
    - c. 053100 Steel Decking
  - 4. 083613 Sectional Doors
  - 5. 084313 Storefront
  - 6. 087100 Door Hardware
  - 7. 133419 Metal Building Systems
  - 8. Sprinkler
    - a. 211313 Automatic Sprinkler Systems
    - b. 211316 Dry Pipe Sprinkler
  - 9. Plumbing Fixtures
    - a. 223400 Water Heaters
    - b. 224213.13 Water Closets
    - c. 224213.16 Urinals
    - d. 224216.13 Lavatories
    - e. 224216.16 Sinks
    - f. 224500 Emergency Plumbing Fixtures
  - 10. Mechanical Equipment
    - a. 235523.16 Radiant Heaters
    - b. 235533.16 Unit Heaters
    - c. 237413 Roof Top Equipment
  - 11. Electrical Equipment

- a. 262413 Electrical Switchboards
- b. 262416 Electrical Panelboards
- 12. Lighting
  - a. 265219 Emergency and Exit Lighting
  - b. 265119 Interior Lighting
  - c. 265619 Exterior Lighting
- 13. 283133.13 Fire Alarm

- B. For any submittals submitted for review that are not included on this list, they will be returned and marked, "Not Required, Not Reviewed"

### 3.3 NUMBER OF COPIES OF SUBMITTALS

- A. Documents for Review:
  - 1. Submit all required documents for complete review. Ensure file is large enough for review and all notes and details are legible.

### 3.4 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
  - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
  - 1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

### 3.5 CONTRACTOR'S REVIEW

- A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Project Closeout and Maintenance Material Submittals: See requirements in Section 017800 "Closeout Submittals."
- C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

### 3.6 ARCHITECT'S ACTION

- A. General: GC is required to utilize the RFI and Submittal form located at the end of this section for all RFIs and Submittals Architect will not review submittals that do not include this and will be simultaneously rejected.
- B. Action Submittals: Architect will review each submittal and RFI, make marks to indicate corrections or revisions required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.
- C. Informational Submittals: Architect will review each submittal and will not return it or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- D. Incomplete submittals are unacceptable, will be considered non-responsive, and will be returned for resubmittal without review.
- E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 013300

# BSRO RFI's COVER PAGE

## Firestone / Tires Plus / Hibdon Tires Plus

City/Project Name:  
State:

RFI Number:  
RFI Subject:  
Date:

RFI Description/Question:  
Requested By:

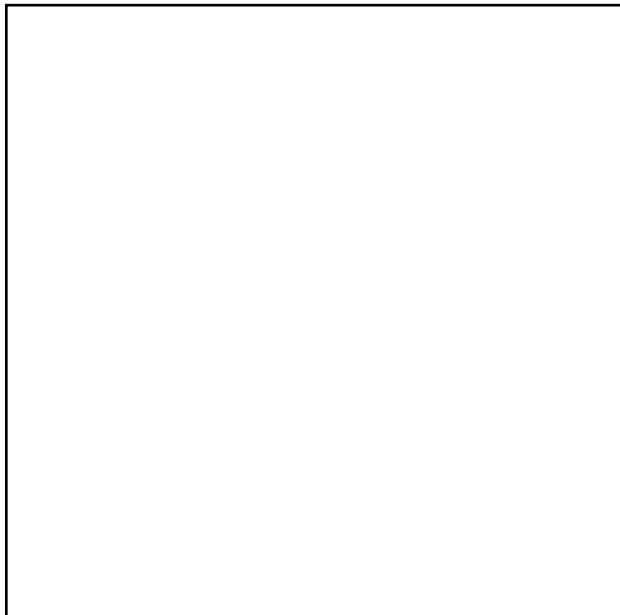
RFI Response:

Answered By:  
Disciplines Affected:

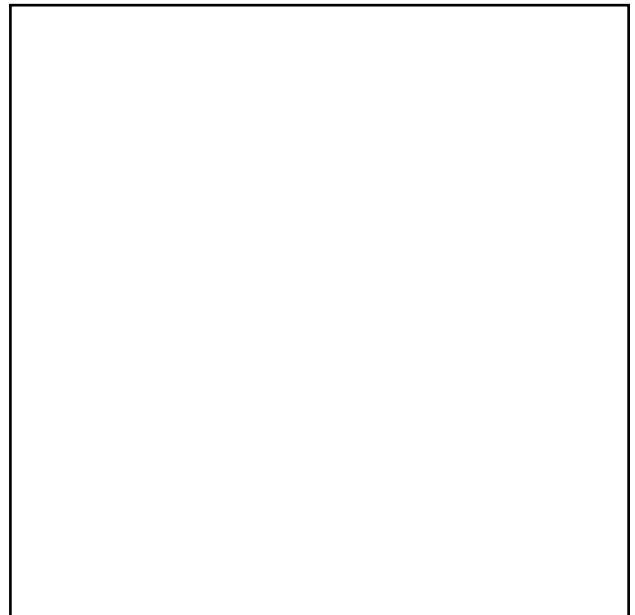
**BSRO SUBMITTALS/SHOP DRAWINGS  
COVER PAGE  
Firestone / Tires Plus / Hibdon Tires Plus**

City/Project Name:  
State:  
Submittal Name:  
Date:

GC Shop Drawing Review Stamp



Architect/Engineer Shop Drawing Review Stamp





## SECTION 014000 - QUALITY REQUIREMENTS

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section Includes:
  - 1. Administrative and procedural requirements for Contractor quality assurance and quality control.
- B. Related Requirements:
  - 1. General Conditions: Inspections, testing, and approvals required by public authorities. Contractor obligations to perform work in accordance with Contract Documents.
  - 2. Section 017700 – Closeout Procedures: Project Record Documents.

## 1.2 DEFINITIONS

- A. Testing: Evaluation of systems, primarily requiring physical manipulation and analysis of materials, in accordance with approved standards.
- B. Inspection: Evaluation of systems primarily requiring observation and engineering judgment.
- C. Quality Assurance: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will substantially comply with construction documents.
- D. Quality Control: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction substantially comply with construction documents.
- E. Mockups: Full-size, physical assemblies that are constructed on-site. Mockups are used to verify or demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Approved mockups establish the standard by which the Work will be judged.
- F. Architect of Record (AOR): The prime consultant in charge of overall design and coordination of the building.
- G. Engineer of Record (EOR): The Registered Engineer in responsible charge of engineering design for the project.
- H. Structural Engineer of Record (SER): The Registered Engineer in responsible charge of the structural design for the project.
- I. Civil Engineering Consultant (CEC): The Registered Engineer in responsible charge of the civil design for the project.
- J. Architect - Engineer (A/E): A collective term to include the AOR, CEC, SER, and the Mechanical, Electrical, and Fire Protection EOR.
- K. Construction Testing Laboratory (CTL): The independent testing and inspection agency employed by the Owner.
- L. Independent Test and Balance Agent (ITBA): The independent HVAC testing and balancing agency employed by the Owner.

- M. Special Inspector (SI): The Special Inspector under the direct supervision of a registered civil/structural engineer (unless otherwise specified) regularly engaged in inspection and experienced with the type of work requiring related testing and inspection. The categories of special inspector are specified in Section 01458:
- N. Building Official: The Officer or his duly authorized representative charged with the administration and enforcement of the local building code.
- O. Deviation: A deviation is any item or component of work that does not substantially conform to the requirements of the construction documents and which has not been corrected by the end of business on the day it is identified.

### 1.3 STANDARDS AND REFERENCES

- A. Except where the Contract Documents include more stringent requirements, applicable industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced.
- B. Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
- C. Where copies of standards are needed to perform a required construction activity, the contractor shall obtain copies directly from the publication source at his own expense.
- D. Trade association names and titles of general standards are frequently abbreviated. The following acronyms or abbreviations, as referenced in the Contract Documents are defined to mean the associated name.

#### Master Listing of Specification Standard and Reference Sources:

AABC MN	Associated Air Balance Council
ABMA STD	American Bearing Manufacturers Association, Inc.
ACI	American Concrete Institute International
AISC	American Institute of Steel Construction, Inc.
ANSI	American National Specification Institute
ARI	Air-Conditioning and Refrigeration Institute
ASHRAE	American Society of Heating, Refrigeration and Air-Conditioning Engineers, Inc.
ASME	American Society of Mechanical Engineers
ASSE	American Society of Sanitary Engineering
ASTM	American Standard Testing Methods
AWS	American Welding Society
AWWA	American Water Works Association
CISPI	Cast Iron Soil Pipe Institute
GA	Gypsum Association
IEEE	Institute of Electrical and Electronic Engineers
IIAR	International Institute of Ammonia Refrigeration
IMIAWC	International Masonry Industry All-Weather Council
MSS	Manufacturers Standardization Society of the Valve and Fitting Industry, Inc.
NEBB	National Environmental Balancing Bureau
NECA	National Electrical Contractors Association
NEMA	National Electrical Manufacturers Association
NETA	International Electrical Testing Association
NFPA	National Fire Protection Association



PDI	Plumbing and Drainage Institute
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association
UL	Underwriters Laboratories, Inc.

- E. For products and workmanship specified, comply with requirements of the applicable reference and standard, except when more rigid requirements are specified or are required by applicable codes.
- F. Conform to reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.
- G. Should specified reference standards have conflict with Contract Documents, request clarification from the Owner's Representative before proceeding.
- H. Reference BSRO's Testing Specification (Construction Material Testing & Observation Agreement Requirements) by BSRO's contract testing agency.

#### 1.4 CONFLICTING REQUIREMENTS

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

#### 1.5 SUBMITTALS

- A. Contractor's Record Letters of Conformance:
  - 1. Submit completed Record Letter of Conformance located at the end of each applicable Section.
  - 2. Complete required information on the Record Letter of Conformance. Provide signature in ink by the person authorized to sign on behalf of the Contractor.
  - 3. No modifications to the form are permitted.

#### 1.6 QUALITY ASSURANCE

- A. Contractor's Record Letters of Conformance:
  - 1. By submitting Record Letters of Conformance, the Contractor declares that the product identified by Manufacturer's name and model number is (one of) the product(s) specified and is suitable for the intended use as defined within the Contract Documents, and has been provided and placed in operational condition in accordance with the Manufacturer's published instructions and the Contract Documents.

#### 1.7 WARRANTIES AND BONDS

- A. Submit required warranties and bonds through the Electronic Process.
  - 1. Assemble documents from Subcontractors, suppliers, and Manufacturers.
  - 2. For equipment put into use with Owner's acceptance during construction, submit within ten (10) days after first operation, listing date of acceptance as start of warranty period.

3. For items of Work delayed materially beyond Date of Substantial Completion, provide updated submittal within ten (10) days after acceptance, listing date of acceptance as start of warranty period.

## PART 2 - PRODUCTS

NOT USED

## PART 3 - EXECUTION

### 3.1 CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, Manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply with Manufacturer's instructions, including each step-in sequence.
- C. Should Manufacturer's instructions conflict with Contract Documents, request clarification from Owner's Representative before proceeding.
- D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

### 3.2 TOLERANCES

- A. Comply with Manufacturer's tolerances. Should Manufacturer's tolerances conflict with Contract Documents, request clarification from Owner's Representative before proceeding.

### 3.3 DEFECT ASSESSMENT

- A. Replace Work or portions of the Work not conforming to specified requirements.
- B. If, in the opinion of the Owner's Representative, it is not practical to remove and replace the Work, the Owner's Representative will direct an appropriate remedy or adjust payment.
- C. Refer to Invitation to Bid Section 001116: Special Procedures.

### 3.4 CONTRACTOR SITE OBSERVATION OF PROJECT LANDSCAPING

- A. The Contractor will, after Project completion:
  1. Perform a monthly site observation for a period of 12 months to inspect plant materials and irrigation system.
    - a. Provide a 12-month warranty on all landscaping and irrigation work.
    - b. Repair or replace landscaping and irrigation work as determined by Owner.

END OF SECTION 014000

## SECTION 014323.10 – FIXTURE INSTALLERS

## 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 a list of approved national fixture installers.

## PART 2 - PRODUCTS

## 2.1 APPROVED FIXTURE INSTALLERS

- A. The following may be used to install store fixtures, as indicated on Drawings:

1. Buss Construction  
P.O. Box 8576  
Hot Springs Village, AR 71910  
Contact: Jim Buss  
Office: (501) 623-7916  
Cell: (501) 366-7790  
FAX: (501) 623-7936  
Email: [jkbuss@buss-construction.com](mailto:jkbuss@buss-construction.com)
2. Luke Condrón  
L.C. Enterprises, Inc.  
588 Spruce St.  
Monte Vista, CO 81144  
Office: (719) 588-6964  
Email: [luke@lukecenterprises.com](mailto:luke@lukecenterprises.com)
3. Charlie Bergh  
Bergh Construction Company  
PO Box 22657  
St. Petersburg, FL 33742  
Office: (802) 238-3222  
Email: [berghconstruction@gmail.com](mailto:berghconstruction@gmail.com)
4. Peter Sher  
Apollo Retail  
7462 Candlewood Road, Suite D  
Hanover, MD 21076  
Office: (520) 661-7209  
Email: [peter.sher@apolloretil.com](mailto:peter.sher@apolloretil.com)

- B. Substitutions not allowed.

### PART 3 - EXECUTION

Not Used

END OF SECTION 014323.10

## SECTION 014523 – TESTING AND INSPECTING SERVICES

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section Includes:
  - 1. Administrative and procedural requirements for testing and inspecting services.
- B. Related Requirements:
  - 1. General Conditions: Inspections, testing, and approvals required by public authorities. Contractor obligations to perform work in accordance with Contract Documents.
  - 2. Section 017700 – Closeout Procedures: Project Record Documents.
- C. Contractor testing and inspection are required to verify compliance with requirements specified or indicated.
  - 1. Contractor testing and inspection includes testing or inspection to be performed by and under the responsibility of the General Contractor as well as that required by the Manufacturer, Manufacturer's representative, product supplier, or other party under the responsibility of the Contractor.
  - 2. Specific quality assurance and control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
  - 3. Requirements for Contractor to provide quality assurance and control services required by Architect, Owner's CTL, Owner's Construction Manager, or authorities having jurisdiction are not limited by provisions of this Section.

## 1.2 TESTING AND INSPECTION AGENCIES

- A. Contractor to coordinate scheduling of testing agency in accordance to prescribed observations.
- B. Coordination of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.
- C. Owner Employed Agency:
  - 1. Testing agency: Comply with requirements of ASTM C802.
  - 2. Inspection agency: Comply with requirements of ASTM D290.
  - 3. Laboratory: Authorized to operate in State in which Project is located.
  - 4. Laboratory Staff: Maintain a full-time registered Engineer on staff to review services.
  - 5. Testing Equipment: Calibrated at reasonable intervals with devices of an accuracy traceable to either National Bureau of Standards or accepted values of natural physical constants.

## PART 2 - PRODUCTS

NOT USED

## PART 3 - EXECUTION

## 3.1 TESTING AND INSPECTION

- A. Owner will employ under separate agreement a construction material testing and observation firm.
- B. Contractor Responsibilities:
  - 1. Schedule the testing firm for required observations and test as specified in the applicable Sections.

2. Give testing firm appropriate advance notice to perform observations and tests. Cancelled observation and testing appointments by the Contractor may result in back charges to the Contractor.
  3. Required observations and testing which are not performed on schedule may result in back charges to the Contractor.
  4. Deliver to agency at designated location, adequate samples of materials proposed to be used which require testing, along with proposed mix designs.
  5. Cooperate with laboratory personnel and provide access to the Work and to Manufacturers' facilities.
  6. Provide incidental labor and facilities:
    - a. To provide access to Work to be tested/inspected.
    - b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
    - c. To facilitate tests/inspections.
    - d. To provide storage and curing of test samples.
- C. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency.

### 3.2 REQUIRED TESTS – EXCERPTS FROM CONSTRUCTION MATERIAL TESTING AND OBSERVATION AGREEMENT

- A. Site and Building Excavation and Backfilling Testing Specification:
1. The Testing Specifications listed below shall be executed without deviation in accordance with the Project Drawings and Specifications. Any discrepancies between these documents will be brought to the immediate attention of the Owner.
  2. All reports shall be made on 8-1/2 x 11 white papers, suitable for photocopying and binding in booklet form. All sheets shall have the Testing and Engineer's letterhead (including phone number, address and email address). Larger sheets shall be folded and bound into the booklet. Reports shall include:
    - a. Date issued.
    - b. Project title and number as it appears on the Contract Documents.
    - c. Name of the inspector.
    - d. Name and seal of registered engineer in responsible charge.
    - e. Date and time of sampling or inspection.
    - f. Identification of product and specification section.
    - g. Location of sampling or inspection in the Project.
    - h. Type of inspection or test performed.
    - i. Date of test.
    - j. Results of test.
    - k. Indicate conformance or non-conformance with the Contract Document requirements and provide Testing and Engineer's interpretation of test or inspection results.
  3. All tests and inspections not conforming to the Contract Documents shall be stamped with a red stamp indicating non-conformance and distributed within 20 hours of discovery using the red-letter format attached to this document.
  4. After each inspection or test, a report shall be distributed within three calendar days to:

Owner	1 copy
Bridgestone Retail Operations, LLC Zone Construction Manager	1 copy
SITE-Work Engineering Consultant	1 copy
Developer or Contractor	3 copies
Building Official	as Required
Architectural Consultant	1 copy

### 3.3 INSPECTION SERVICES FOR SITE AND BUILDING EXCAVATION AND BACKFILLING

- A. Inspection Services for Site and Building Excavation and Backfilling shall include the following:
1. Prior to placement of backfill materials in the floor slab and parking areas observe the subgrade to determine that the soils are suitable for support of the floor slab.
  2. Observe proof rolling operations in any remaining, accessible areas of the subgrade in the building and pavement areas to identify and report any soft or unstable soils prior to any placement of fill or base coarse material across the site.
  3. Within the building area, perform one (1) test for every 100 cubic yards of fill and backfill or in areas of natural grade or cut, one (1) test for every 1000 square feet, except that such tests must be located as to give equal coverage to all portions of the building sub-grade.
  4. Within the paved areas of the site except trench excavations, one (12) test for every 500 cubic yards of fill or in area of natural grade or cut one (1) test for every 2000 square feet.
    - a. Within trench excavations provide one (1) test for every 200 cubic yards or 50 linear feet of fill or back fill.
    - b. Building foundation excavation and subgrade preparation shall be observed for conformity to the size, depth and suitability of the excavated areas and test for verification of the soil bearing capacity for compliance with the geotechnical recommended specified values. Porous fill shall be examined for soils classification, depth and percentage of compaction.
  5. Using the geotechnical engineering report as a guide, report any deviation from the recommendations contained within the geotechnical report and point out the deviation to the job superintendent. Do not make any recommendations for means and methods to be used by Contractor.
  6. Test and verify soil-bearing capacity of each column footing and every 30 lineal feet of wall foundation.
  7. Perform the following tests as necessary:
    - a. Atterberg Limits Test – two (2) tests anticipated.
    - b. Percent Fines - two (2) tests anticipated.
    - c. Standard Proctor - two (2) tests anticipated.
    - d. Nuclear Density Gauge to evaluate bearing soils at spread footing excavation and for fill soils – ten visits anticipated.
    - e. Hand auger and penetrometer for native soils.

### 3.4 ASPHALT/CONCRETE PAVEMENT TESTING

- A. The Testing Specifications listed below shall be executed without deviation in accordance with the Project Drawings and Specifications. Any discrepancies between these documents will be brought to the immediate attention of the Owner.
- B. All reports shall be made on 8-1/2 x 11 white papers, suitable for photocopying and binding in booklet form. All sheets shall have the Testing and Engineer's letterhead (including phone number, address and email address). Larger sheets shall be folded and bound into the booklet. Reports shall include:
1. Date issued.
  2. Project title and number as it appears on the Contract Documents.
  3. Name of the inspector.
  4. Name and seal of registered engineer in responsible charge.
  5. Date and time of sampling or inspection.
  6. Identification of product and specification section.
  7. Location of sampling or inspection in the Project.
  8. Type of inspection or test performed.
  9. Date of test.
  10. Results of test.

11. Indicate conformance or non-conformance with the Contract Document requirements and provide Testing and Engineer's interpretation of test or inspection results.
- C. All tests and inspections not conforming to the Contract Documents shall be stamped with a red stamp indicating non-conformance and distributed within 20 hours of discovery using the red-letter format attached to this document.
- D. After each inspection or test, a report shall be distributed within three calendar days to:
 

Owner	1 copy
Bridgestone Retail Operations, LLC Zone Construction Manager	1 copy
SITE-Work Engineering Consultant	1 copy
Developer or Contractor	3 copies
Building Official	as Required
Architectural Consultant	1 copy

### 3.5 INSPECTION SERVICES FOR ASPHALT TESTING AND INSPECTION

- A. Inspection Services for Asphalt Testing and Inspection shall include:
  1. Take one (1) core sample at the rate of not less than one every 10,000 square feet of parking lot area, but not less than three (1) cores in light duty areas or three (1) cores in heavy duty areas. Testing and Engineer shall consult with the Owner for locations prior to the commencement of coring. Selection of core locations shall provide the greatest amount of information for the area tested.
- B. Perform the following tests:
  1. Compression tests in accordance with ASTM C39.
  2. Asphalt density tests in accordance with ASTM D2950.
  3. Asphalt density tests in accordance with ASTM D2950.
  4. Extraction and gradation tests in accordance with ASTM D4074 and ASTM D71.
  5. Measure thickness of pavement.
- C. Testing during placement of asphalt concrete mixture:
  1. Test engineer shall be on-site when placement begins.
  2. Perform on-site density tests utilizing Nuclear Density equipment.
  3. Record ambient temperature.
  4. Record asphalt mixing temperatures.

### 3.6 CONCRETE TESTING

- A. The Testing Specifications listed below shall be executed without deviation in accordance with the Project Drawings and Specifications. Any discrepancies between these documents will be brought to the immediate attention of the Owner.
- B. All reports shall be made on 8-1/2 x 11 white papers, suitable for photocopying and binding in booklet form. All sheets shall have the Testing and Engineer's letterhead (including phone number, address and email address). Larger sheets shall be folded and bound into the booklet. Reports shall include:
  1. Date issued.
  2. Project title and number as it appears on the Contract Documents.
  3. Name of the inspector.
  4. Name and seal of registered engineer in responsible charge.
  5. Date and time of sampling or inspection.
  6. Identification of product and specification section.
  7. Location of sampling or inspection in the Project.
  8. Type of inspection or test performed.
  9. Date of test.



10. Results of test.
  11. Indicate conformance or non-conformance with the Contract Document requirements and provide Testing and Engineer's interpretation of test or inspection results.
- C. All tests and inspections not conforming to the Contract Documents shall be stamped with a red stamp indicating non-conformance and distributed within 20 hours of discovery using the red-letter format attached to this document.
- D. After each inspection or test, a report shall be distributed within three calendar days to:
- |  |             |
|--|-------------|
| Owner  | 1 copy      |
| Bridgestone Retail Operations, LLC Zone Construction Manager | 1 copy      |
| SITE-Work Engineering Consultant                             | 1 copy      |
| Developer or Contractor                                      | 3 copies    |
| Building Official  | as Required |
| Architectural Consultant                                     | 1 copy      |
- Concrete sampling shall be performed by an ACE certified technician, Grade 1 or higher.

### 3.7 TESTING SERVICES FOR CONCRETE

- A. Testing Services for concrete shall include the following:
1. Review Contractor's proposed materials and mix design for conformance with specifications.
  2. Conduct strength tests as required in the Specification.
  3. Secure composite samples in accordance with ASTM C172. Sample at regularly spaced intervals from the middle portion of the batch. Sampling time shall not exceed fifteen (15) minutes.
  4. Mold and cure specimens in accordance with ASTM C31.
    - a. A minimum of four (4) concrete test cylinders shall be taken for every 100 cubic yards or less of each class of concrete placed each day and not less than once for each 4,000 square feet of surface area for slab.
    - b. Initial cure during the first 24 hours shall be made by placing cylinders adjacent to the pour. Protect cylinders for loss of moisture by covering with wet sand, burlap, visqueen, or curing compound. Protect cylinders from direct sunlight or radiant heating devices. Do not disturb cylinders.
    - c. Do not transport cylinders to laboratory within the first 48 hours. Protect cylinders from vibration, freezing temperatures and moistures loss during transportation.
    - d. Wet cure cylinders under controlled temperature until testing.
  5. Test Cylinders in accordance with ASTM C39.
    - a. Date test cylinders and number consecutively. Give each cylinder of each set an identifying letter (i.e. A, B, C etc.). Prepare a sketch of the building plan for each test set identifying the placed concrete location(s).
    - b. Test one cylinder (A) at 7 days for information.
    - c. Test two cylinders (B and C) at 28 days and the average of the breaks shall constitute the compressive strength of the concrete sample.
    - d. Retain fourth cylinder (D) for further testing if needed, but do not cylinder for more than 60 days.
  6. Conduct slump test for each cylinder set taken in accordance with ASTM C143. Make additional slump tests for every other load from a stationary mixer or truck to test consistency. Sampling shall be in accordance with ASTM C172.
  7. Conduct air content test for each cylinder set for concrete exposed to freeze-thaw in accordance with ASTM C231, ASTM C173, or ASTM C138. Indicate the test method on the report. Test shall be made at the same time as the slump test.
  8. Conduct temperature test for each concrete sample.
  9. In addition to the required information noted previously in this section, record the following information on concrete compression reports:
    - a. Test cylinder number and letter.
    - b. Specific foundations or structures covered by this test.

- c. Proportions of concrete mix or mix identification.
  - d. Maximum size coarse aggregate.
  - e. Specified compressive strength.
  - f. Tested compressive strength.
  - g. Slump, air contentment (when applicable) and concrete temperature.
  - h. Date and time concrete were placed.
  - i. Ambient temperature during concrete placement.
  - j. Type of fracture during the test.
- 10. At the start of each day's mixing, report any significant deviations from approved mix designs including temperature, moisture and condition of aggregate.
  - 11. Certify each delivery ticket of concrete. Report type of concrete delivered, amount of water added and time at which the cement and aggregate were loaded into the truck, and time at which concrete was discharged from the truck.

### 3.8 MASONRY TESTING

- A. The Testing Specifications listed below shall be executed without deviation in accordance with the Project Drawings and Specifications. Any discrepancies between these documents will be brought to the immediate attention of the Owner.
- B. All reports shall be made on 8-1/2 x 11 white papers, suitable for photocopying and binding in booklet form. All sheets shall have the Testing and Engineer's letterhead (including phone number, address and email address). Larger sheets shall be folded and bound into the booklet. Reports shall include:
  - 1. Date issued.
  - 2. Project title and number as it appears on the Contract Documents.
  - 3. Name of the inspector.
  - 4. Name and seal of registered engineer in responsible charge.
  - 5. Date and time of sampling or inspection.
  - 6. Identification of product and specification section.
  - 7. Location of sampling or inspection in the Project.
  - 8. Type of inspection or test performed.
  - 9. Date of test.
  - 10. Results of test.
  - 11. Indicate conformance or non-conformance with the Contract Document requirements and provide Testing and Engineer's interpretation of test or inspection results.
- C. All tests and inspections not conforming to the Contract Documents shall be stamped with a red stamp indicating non-conformance and distributed within 20 hours of discovery using the red-letter format attached to this document.
- D. After each inspection or test, a report shall be distributed within three calendar days to:
 

Owner	1 copy
Bridgestone Retail Operations, LLC Zone Construction Manager	1 copy
SITE-Work Engineering Consultant	1 copy
Developer or Contractor	3 copies
Building Official	as Required
Architectural Consultant	1 copy

### 3.9 TESTING AND INSPECTION SERVICES FOR MASONRY

- A. Testing and Inspection Services for Masonry shall include the following:
  - 1. Mortar Grout:
    - a. Conduct strength tests in accordance with ASTM C1090 (UBC Std 24 – 28).
    - b. Take two strength samples for each 2500 square feet of masonry wall surface, for each type of group placed each day.

- c. Create test samples by forming with wood surface on bottom and concrete block on sides. The samples shall be 3 inches square and 8 inches high.
    - d. Initial cure during first 48 hours. Protect samples from loss of moisture by covering with wet cloth and keeping moist. Protect from freezing and variations in temperature. Record maximum and minimum temperatures by using max. /min. thermometer.
    - e. Remove masonry units that form samples after 48 hours and transport group samples to laboratory. Keep samples protected from vibration, freezing, and moisture loss during transportation.
    - f. Test samples with test method ASTM C39 at 28 days. Compressive strength shall be the average of the two samples and shall be adequate if it equals fm as defined on the drawings but not less than 2000 psi.
  2. Conduct slump test at the time compressive test samples are taken in accordance with ASTM C143. Grout shall have a slump between 8 inches and 11 inches.
- B. In addition to the required information noted previously in this specification, record the following information on group reports:
  1. Mix design or mix designation.
  2. Test sample number.
  3. Specific wall areas covered by the test.
  4. Description of sample – dimensions amount out of plumb in percent.
  5. Description of units used to form sample.
  6. Curing history with maximum /minimum temperature and age when transported to the lab and age when tested.
  7. Tested compressive strength.
  8. Description of failure.
- C. Mortar:
  1. Prepare and test mortar in accordance with the following (UBC Std. 24 – 22):
    - a. Spread mortar on the masonry units ½ to 5/8-inch-thick and allow standing for one minute.
    - b. Remove mortar and place in a 2 inch by 4-inch cylinder in two layers, compressing the mortar into the cylinder using a flat end stick or fingers. Lightly tap the mold on opposite sides, level off and immediately cover molds and keep them damp until taken to the laboratory.
    - c. Opposite sides, level off and immediately cover molds and keep them damp until taken to the laboratory.
    - d. After 48 hours set, have the laboratory remove molds and place them in the fog room until testing in damp conditions.
  2. Execute one mortar test specimen for each 2,500 square feet of masonry wall constructed and minimum of one mortar test specimen for each date that masonry construction is performed. Test specimen at 28 days.
  3. Strength of mortar will be considered satisfactory if each mortar test equals or exceeds 1,500 psi (this corresponds with type S, 2000 psi mortar mix as defined in the Contract Documents).
- D. In addition to the required information noted previously in this section, record the following information on the masonry mortar compression reports:
  1. Mix design or mix designation.
  2. Test sample number.
  3. Specific wall areas covered by the test.
  4. Description of units used to form the sample.
  5. Tested compressive strength.

### 3.10 STRUCTURAL INSPECTION

- A. The Testing Specifications listed below shall be executed without deviation in accordance with the Project Drawings and Specifications. Any discrepancies between these documents will be brought to the immediate attention of the Owner.

- B. All reports shall be made on 8-1/2 x 11 white papers, suitable for photocopying and binding in booklet form. All sheets shall have the Testing and Engineer's letterhead (including phone number, address and email address). Larger sheets shall be folded and bound into the booklet. Reports shall include:
1. Date issued.
  2. Project title and number as it appears on the Contract Documents.
  3. Name of the inspector.
  4. Name and seal of registered engineer in responsible charge.
  5. Date and time of sampling or inspection.
  6. Identification of product and specification section.
  7. Location of sampling or inspection in the Project.
  8. Type of inspection or test performed.
  9. Date of test.
  10. Results of test.
  11. Indicate conformance or non-conformance with the Contract Document requirements and provide Testing and Engineer's interpretation of test or inspection results.
- C. All tests and inspections not conforming to the Contract Documents shall be stamped with a red stamp indicating non-conformance and distributed within 20 hours of discovery using the red-letter format attached to this document.
- D. After each inspection or test, a report shall be distributed within three calendar days to:
- |  |             |
|--|-------------|
| Owner  | 1 copy      |
| Bridgestone Retail Operations, LLC Zone Construction Manager | 1 copy      |
| SITE-Work Engineering Consultant                             | 1 copy      |
| Developer or Contractor                                      | 3 copies    |
| Building Official  | as Required |
| Architectural Consultant                                     | 1 copy      |

### 3.11 STRUCTURAL INSPECTION SERVICES

- A. Concrete Foundations and Slabs-on-Grade:
1. Inspect foundations for compliance with Drawings and Specifications. Report on the following:
    - a. Concrete footing size and depth.
    - b. Footing rebar size, spacing and placement (cover).
    - c. Placement and vibration of concrete.
    - d. Dowel bar size, orientation, embedment and spacing.
    - e. Anchor bolt size, orientation, embedment and spacing.
  2. Inspect slabs-on-grade for compliance with Drawings and Specifications. Report on the following:
    - a. Preparation of subgrade.
    - b. Slab thickness.
    - c. Size, spacing, placement (cover) and lap of reinforcement, if applicable.
    - d. Size, spacing and placement of joint dowels.
    - e. Placement and finishing of concrete.
    - f. Time of saw cuts after placement of concrete.
- B. Masonry Walls:
1. Inspect walls for compliance with Drawings and Specifications. Report on the following:
    - a. Placement of concrete masonry units (joint space, level, plumb).
    - b. Horizontal reinforcing, spacing and lap.
    - c. Vertical bar size, spacing and placement (spacing across width of wall) at walls and control joints.
    - d. Vertical bar laps.
    - e. Lift heights, placement and vibration of grout.

2. Inspect bond beams for compliance with Drawings and Specifications. Report on the following:
  - a. Location.
  - b. Size, placement, and lap of reinforcing bars.
  - c. Placement and vibration of group.
3. Inspect openings for compliance with Drawings and Specifications. Report on following:
  - a. Types of concrete masonry units used to form lintels.
  - b. Reinforcing bar size and placement at lintels.
  - c. Stirrup size and spacing at lintels.
  - d. Vertical reinforcing size and placement at the door jambs.
  - e. Placement and vibration of grout in lintels and jambs.
  - f. Vertical reinforcing size and placement at door jambs.
  - g. Placement and vibration of gout in lintels and jambs.
4. Inspect pilasters for compliance with Drawings and Specifications. Report on the following:
  - a. Vertical reinforcing size and placement.
  - b. Tie size and placement.
  - c. Placement and vibration of grout.
5. Inspect walls for compliance with Drawings and Specifications. Report on the following:
  - a. Spacing and grouting of embedded plates for joist bearing.
  - b. Spacing and grouting (or installation of Hilti anchors) of embedded plated for continuous angle attachment at roof perimeter.

### 3.12 STRUCTURAL STEEL INSPECTION

- A. Inspection of columns, beams, joists and joist girders for compliance with Drawings and Specifications shall be by a structural engineer licensed in the state where the project is located. Report on the following:
  1. Size.
  2. Straightness.
  3. Erection tolerances and bearing length.
    - a. Minimum 2-1/2-inch bearing length for joists.
    - b. Minimum 6 inches bearing length for joist girders.
    - c. Imperfections or damage.
- B. Inspection of bolted connections for placement and tightness shall be by a structural engineer licensed in the state where the project is located. High strength bolts shall be torque to a minimum value as shown in the specification for Structural Joists using A325 or A490 bolts. Report on the following:
  1. 4 locations of joist girder to column connections shall be selected at random and checked.
  2. 4 locations of beam to column connections shall be selected at random and checked.
  3. 4 locations of column to footing connections shall be selected at random and checked.
- C. Inspect welded connections for compliance with Drawings and Specifications. Welding inspection shall be done by a Welding Inspector certified by AWS in accordance with AWS QCI Standard and Guide for qualifications and certification for welding inspectors and meeting the qualifications required of AWS D1.1. Report on the following:
  1. 10 locations of joist to joist girder welds shall be selected at random and visually inspected for length and size of weld.
  2. 10 locations of joist girder to column welds, when applicable, shall be selected at random and visually inspected for length and size of weld.
- D. If approved by the Owner, the testing engineer shall verify the adequacy of the welds in question by means of ultrasonic inspection.
  1. Inspect steel roof deck for compliance with Drawings and Specifications. Report on the following:
    - a. Select 6 random sheets for each type of deck used and inspect for deck thickness, type and material.

- b. Inspect 10 percent of deck welds/connections over the entire roof area for size and spacing (CWI to perform inspection).
- c. Inspect 10 percent of side lap connectors over the entire roof area for type, size and spacing for side al connectors.

END OF SECTION 014523

## SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Requirements:
  - 1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.
  - 2. Section 016400 "Bridgestone Furnished Products" for Bridgestone provided signage.

## 1.3 USE CHARGES

- A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, occupants of Project, testing agencies, and authorities having jurisdiction.
- B. Sewer Service: Pay sewer-service use charges for sewer usage by all entities for construction operations.
- C. Water Service: Pay water-service use charges for water used by all entities for construction operations.
- D. Electric Power Service: Pay electric-power-service use charges for electricity used by all entities for construction operations.

## 1.4 INFORMATIONAL SUBMITTALS

- A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.
- B. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.
- C. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.
- D. Moisture-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage.

1. Describe delivery, handling, and storage provisions for materials subject to water absorption or water damage.
  2. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.
- E. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Identify further options if proposed measures are later determined to be inadequate. Include the following:
1. Locations of dust-control partitions at each phase of work.
  2. HVAC system isolation schematic drawing.
  3. Location of proposed air-filtration system discharge.
  4. Waste handling procedures.
  5. Other dust-control measures.

## 1.5 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
- C. Accessible Temporary Egress: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines.

## 1.6 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Chain-Link Fencing: Minimum 2-inch, 0.148-inch- thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts.
- B. Portable Chain-Link Fencing: Minimum 2-inch, 0.148-inch- thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top and bottom rails. Provide concrete bases for supporting posts.
- C. Wood Enclosure Fence: Plywood, 6 feet high, framed with four 2-by-4-inch rails, with preservative-treated wood posts spaced not more than 8 feet apart.
- D. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil minimum thickness, with flame-spread rating of 15 or less per ASTM E 84 and passing NFPA 701 Test Method 2.



- E. Dust-Control Adhesive-Surface Walk-off Mats: Provide mats minimum 36 by 60 inches.

## 2.2 TEMPORARY FACILITIES

- A. Field Offices, General: Pre-fabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
- B. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Architect, Construction Manager, and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:
  - 1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
  - 2. Conference room of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service and 120-V ac duplex receptacles, with no fewer than one receptacle on each wall. Furnish room with conference table, chairs, and 4-foot- square tack and marker boards.
  - 3. Drinking water and private toilet.
  - 4. Coffee machine and supplies.
  - 5. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.
  - 6. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.
  - 7. Storage space to accommodate small items that should not be left out on the job site overnight.
  - 8. Provide three hard hats for the Owners and its consultants use.
- C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
  - 1. Store combustible materials apart from building.

## 2.3 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
  - 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
  - 2. Heating Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction and marked for intended location and application.
- C. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

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

### 3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
  - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
  - 1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.
- C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.
- D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
  - 1. Anchor toilet to ground to prevent vandalism.
  - 2. Provide cleaning of toilet on a weekly basis.
- E. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
- F. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
  - 1. Provide dehumidification systems when required to reduce substrate moisture levels to level required to allow installation or application of finishes.
- G. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
  - 1. Install electric power service underground unless otherwise indicated.
- H. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
  - 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
  - 2. Install lighting for Project identification sign.

- I. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install one telephone line(s) for each field office.
  - 1. Provide additional telephone lines for the following:
    - a. Provide a dedicated telephone line for each facsimile machine in each field office.
    - b. Provide one telephone line for Owner's use.
  - 2. At each telephone, post a list of important telephone numbers.
    - a. Police and fire departments.
    - b. Ambulance service.
    - c. Contractor's home office.
    - d. Contractor's emergency after-hours telephone number.
    - e. Architect's office.
    - f. Engineers' offices.
    - g. Owner's office.
    - h. Principal subcontractors' field and home offices.
  - 3. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.
- J. Electronic Communication Service: Provide a desktop computer in the primary field office adequate for use by Architect and Owner to access Project electronic documents and maintain electronic communications. Equip computer with not less than the following:
  - 1. Processor: Intel Pentium D or Intel CoreDuo, 3.0 GHz processing speed.
  - 2. Memory: 4 gigabytes.
  - 3. Disk Storage: 300 gigabyte hard-disk drive and combination DVD-RW/CD-RW drive.
  - 4. Display: 22-inch LCD monitor with 256-Mb dedicated video RAM.
  - 5. Full-size keyboard and mouse.
  - 6. Network Connectivity: 10/100BaseT Ethernet.
  - 7. Operating System: Microsoft Windows XP Professional or Microsoft Windows Vista Business.
  - 8. Productivity Software:
    - a. Microsoft Office Professional, XP or higher, including Word, Excel, and Outlook.
    - b. Adobe Reader 7.0 or higher.
    - c. WinZip 7.0 or higher.
  - 9. Printer: "All-in-one" unit equipped with printer server, combining color printing, photocopying, scanning, and faxing, or separate units for each of these three functions.
  - 10. Internet Service: Broadband modem, router and ISP, equipped with hardware firewall, providing minimum 384 Kbps upload and 1 Mbps download speeds at each computer.
  - 11. Internet Security: Integrated software, providing software firewall, virus, spyware, phishing, and spam protection in a combined application.
  - 12. Backup: External hard drive, minimum 40 gigabyte, with automated backup software providing daily backups.
- K. Digital Camera: Provide digital camera for construction superintendent with capability to imprint date and time on each photo.

### 3.3 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
  - 1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet of building lines that is non-combustible according to ASTM E 136. Comply with NFPA 241.
  - 2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

- B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas within construction limits indicated on Drawings.
  - 1. Provide dust-control treatment that is non-polluting and non-tracking. Reapply treatment as required to minimize dust.
- C. Traffic Controls: Comply with requirements of authorities having jurisdiction.
  - 1. Protect existing site improvements to remain including curbs, pavement, and utilities.
  - 2. Maintain access for fire-fighting equipment and access to fire hydrants.
- D. Parking: Provide temporary parking areas for construction personnel.
- E. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
  - 1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
  - 2. Remove snow and ice as required to minimize accumulations.
- F. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
  - 1. Identification Signs: Provide Project identification signs as indicated on Drawings.
  - 2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
    - a. Provide temporary, directional signs for construction personnel and visitors.
  - 3. Maintain and touchup signs so they are legible at all times.
- G. Waste Disposal Facilities: Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."
- H. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
  - 1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

### 3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
  - 1. Comply with work restrictions specified in Section 011000 "Summary."
- C. Temporary Erosion and Sedimentation Control: Comply with requirements of 2003 EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent, and requirements specified in Section 311000 "Site Clearing."
- D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- E. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

- F. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
  - 1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
- G. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each workday.
- H. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- I. Covered Walkway: Erect protective, covered walkway for passage of individuals through or adjacent to Project site. Coordinate with entrance gates, other facilities, and obstructions. Comply with regulations of authorities having jurisdiction.
  - 1. Construct covered walkways using scaffold or shoring framing.
  - 2. Provide overhead decking, protective enclosure walls, handrails, barricades, warning signs, exit signs, lights, safe and well-drained walkways, and similar provisions for protection and safe passage.
  - 3. Paint and maintain appearance of walkway for duration of the Work.
- J. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
  - 1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.
- K. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.
  - 1. Prohibit smoking in construction areas.
  - 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
  - 3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
  - 4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

### 3.5 MOISTURE AND MOLD CONTROL

- A. Contractor's Moisture-Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.
- B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
  - 1. Protect porous materials from water damage.
  - 2. Protect stored and installed material from flowing or standing water.
  - 3. Keep porous and organic materials from coming into prolonged contact with concrete.
  - 4. Remove standing water from decks.
  - 5. Keep deck openings covered or dammed.

- C. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
  - 1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
  - 2. Keep interior spaces reasonably clean and protected from water damage.
  - 3. Periodically collect and remove waste containing cellulose or other organic matter.
  - 4. Discard or replace water-damaged material.
  - 5. Do not install material that is wet.
  - 6. Discard, replace, or clean stored or installed material that begins to grow mold.
  - 7. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.
- D. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
  - 1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
  - 2. Use permanent HVAC system to control humidity.
  - 3. Comply with Manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
    - a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective.
    - b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
    - c. Remove materials that cannot be completely restored to their manufactured moisture level within 48 hours.

### 3.6 OPERATION, TERMINATION, AND REMOVAL

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

2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017400.10 "Cleaning."

END OF SECTION 015000





## SECTION 016000 - PRODUCT REQUIREMENTS

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section Includes:
  - 1. Substitution Limitations and Procedures.
  - 2. Direct Purchase Products.
- B. Related Requirements:
  - 1. Section 016400 – Bridgestone Furnished Products: Requirements related to Contractor and BSRO furnished products.

## 1.2 DEFINITIONS

- A. Products: Defined as new material, machinery, components, equipment, fixtures, and systems forming the Work. Does not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work. Products may also include existing materials or components required for reuse.

## 1.3 BASIC PRODUCT REQUIREMENTS

- A. For products or workmanship specified by association, trade, or other consensus standards, comply with the requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard by date of issue current on date of Contract Documents.
- C. Obtain copies of standards when required by Contract Documents.
- D. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.
- E. The contractual relationship, duties, and responsibilities of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

## 1.4 PRODUCT OPTIONS

- A. Products Specified by Naming a Single Manufacturer and/or Model Number: Provide specified product only unless otherwise specifically permitted in the Specifications.
- B. Products Specified by Naming Two or More Manufacturers: Provide specified products of Manufacturers and models named only, meeting specification and specified requirements unless otherwise specifically permitted in the Specifications.
- C. Products Specified by Reference Standards or by Description Only: Provide any product meeting specified reference standard or description.

## 1.5 SUBSTITUTION PROCEDURES

- A. Instructions to Bidders: Specify time restrictions for submitting requests for substitutions during the bidding period. Comply with requirements specified in this section.
- B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.
- C. A request for substitution constitutes a representation that the submitter:
  - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
  - 2. Will provide the same warranty for the substitution as for the specified product.
  - 3. Will coordinate installation and make changes to other work which may be required for the Work to be complete with no additional cost to Owner.
  - 4. Waives claims for additional costs or time extension which may subsequently become apparent.
  - 5. Will reimburse Owner and Owner's Representative for review or redesign services associated with re-approval by authorities.
- D. Substitution Submittal Procedure:
  - 1. Submit three copies of request for substitution for consideration. Limit each request to one proposed substitution.
  - 2. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.
  - 3. The Owner's Representative will notify Contractor in writing of decision to accept or reject request.

## 1.6 DIRECT PURCHASE PRODUCTS

- A. Direct purchase products shall be purchased directly by the General Contractor from the Manufacturer or the Pre-Negotiated Supplier as specified in the individual Specifications Sections. Direct purchased products shall not be purchased by any subcontractor regardless of the discipline or subcontract involved in the installation.

## 1.7 PRODUCT DELIVERY REQUIREMENTS

- A. Transport and handle products in accordance with Manufacturer's instructions. Deliver materials and equipment at such stages of work in order to expedite the Work and minimize storage requirements.
- B. Schedule delivery for BSRO and Owner furnished and installed equipment such that upon delivery of equipment to the site, sufficient equipment provisions are in place ready for installation and hook-up.
- C. Promptly inspect shipments to assure that products comply with requirements, quantities are correct, and products are undamaged.
- D. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, and damage. Do not use damaged materials and equipment.

## 1.8 PRODUCT STORAGE AND HANDLING REQUIREMENTS

- A. Provide safe storage of products.

## PRODUCT REQUIREMENTS

- B. Store and protect products in accordance with Manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weather-tight, climate-controlled enclosures.
- C. For exterior storage of fabricated products, place on sloped supports, above ground.
- D. Provide off-site storage and protection when site does not permit on-site storage or protection.
- E. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation.
- F. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- G. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- H. Arrange storage of products to permit access for inspection. Periodically inspect to assure products are undamaged and are maintained under specified conditions.

#### PART 2 - PRODUCTS

- A. Provide interchangeable components of the same Manufacturer, for components being replaced.
- B. Do not use materials and equipment removed from existing premises, except as specifically permitted by the Contract Documents.

#### PART 3 - EXECUTION

NOT USED

END OF SECTION 016000



## SECTION 016400 – BRIDGESTONE FURNISHED PRODUCTS

## PART 1 - GENERAL

## 1.1 RELATED REQUIREMENTS

- A. Section 017700 – Closeout Procedures: Electronic closeout document submission.

## 1.2 OTHER CONTRACTS

- A. It is Bridgestone Retail Operations, LLC (BSRO) intention that other contracts will be let in connection with this building project such as the installation of signs, various shop equipment, etc. The Contractor and all of the Subcontractors shall cooperate with the parties installing special items in order that work can be properly coordinated and completed as expeditiously as possible.

## 1.3 CLOSEOUT SUBMITTALS

- A. Submit Warranties and Operation and Maintenance manuals in accordance with Section 017700.

## 1.4 APPROVED INSTALLERS

- A. Only authorized installers listed in specification section 014323.10 'Fixture Installers' may be used to install BSRO furnished products.
- B. Submit for approval selected installer to BSRO's Construction Manager and Zone Construction Manager immediately following award of Contract.
- C. Rotary Lift Installer: Required to use Manufacturer's Certified Installer.
  - 1. GC to utilize link below to locate Rotary Authorized Installer (RAI) closest to the new store building location to receive installation price quotes:
    - a. <http://www.rotarylif.com/Support-RAI/>
  - 2. Rotary Contact: [firestone@rotarylif.com](mailto:firestone@rotarylif.com)
  - 3. The contract established between the GC and RAI shall require the proposed installer to be an authorized installer through Rotary at the proposed time of the lift installation.
- D. Fire Alarm and Security System Installation: Contractor furnished; contractor installed.
  - 1. This includes all low voltage wiring that needs to be a part of the General Contractor's bid.
  - 2. GC bid any/all local vendors they may want to utilize as well as Stanley Security to determine best pricing of system:
    - a. Contacts:
      - 1) Natalie Kelly ([natalie.kelly@sbdinc.com](mailto:natalie.kelly@sbdinc.com)) (714) 404-0916
      - 2) Dan Nero ([Rudolph.Nero@sbdinc.com](mailto:Rudolph.Nero@sbdinc.com)) (412) 327-5418
  - 3. If Stanley is not selected as the installation/vendor, GC is required to coordinate directly with Al Maier for panel installation, programming, and schedule/timing.
    - a. Contact:
      - 1) Al Maier ([Al.Maier@SBDinc.com](mailto:Al.Maier@SBDinc.com)) (617) 642-0817

## 1.5 WARRANTIES

- A. Provide Manufacturer's standard warranty for BSRO furnished equipment on schedule located at the end of this Section.
- B. Warranty shall cover labor and material costs of repairing or replacing defective materials and repairing any incidental damage caused by failure of installed Work due to defects in materials or manufacturing.

## PART 2 - PRODUCTS

### 2.1 BSRO FURNISHED PRODUCTS

- A. All items that are furnished by BSRO or Tenant for installation by the Contractor, as indicated on Drawings and in Section 010000, will be shipped F.O.B. job site, (street address, city, state, zip). These materials shall be received, unloaded, stored and installed by the Contractor. Contractor shall receive all items from the shipper, unload, check and sign the bill of lading as to number of items received, description, weight, and for visible or concealed damages. Contractor shall be responsible for the security of BSRO furnished items until the construction project is complete.
- B. In the absence of any notes or statement on the Drawings to the effect that various materials are to be furnished by BSRO, then all materials to complete the job are to be furnished by the Contractor.
- C. BSRO expects to furnish when needed, the items listed below, so that Contractor's work schedule may be maintained as contemplated. However, they shall not be responsible for any delays or inability to supply or deliver any materials contemplated to be supplied by them hereunder, provided such delays are occasioned to be fire, the elements, emergency, interruption of transportation facilities, inability to obtain of Bridgestone/Firestone or their source of supply. Contractor shall submit a schedule showing dates materials are to be delivered to job site.
- D. BSRO will pay all delivery charges necessary to ship all BSRO furnished items to the new store site (or to Contractor's yard or other alternate delivery site as requested by Contractor). Any freight charges for demurrage, re-delivery, double handling, temporary storage, etc. that are incurred by BSRO for shipments that are refused by the Contractor, shall be the Contractor's responsibility and shall be deducted from the final payment. These potential extra freight charges shall be charged to the Contractor only if the deliveries are made to the proper location and on or after the date requested by the contractor. BSRO shall be responsible for extra charges if deliveries are made early and subsequently refused. Please be aware that it is very difficult to revise the shipping schedule for items once they have been released.
- E. Tire/Parts Racking Procedure: Architect of Record is responsible to coordinate with John Angotti of Lozier Corporation at kickoff of construction documents for shelving to be ordered/created.
  - 1. The Architect of Record is responsible to provide the following:
    - a. CAD File of Base Plan
    - b. F1 sheet as a PDF
    - c. Whether seismic calculations are required to be provided for review and approval of the AHJ.
      - 1) If seismic calculations are required, this will be a reimbursable expense charged to the client.
  - 2. The seismic calculations are only when truly required by the AHJ and are not always required.
    - a. Contact info:
      - 1) John Angotti
      - 2) Lozier Corporation

- 3) 913.339.9555
- 4) John.angotti@lozier.biz

## 2.2 RECEIVING AND CARING FOR MATERIAL FURNISHED BY BSRO

- A. General Contractor shall be held responsible for receiving and safeguarding of all material furnished by BSRO. General Contractor shall receive all items from the shipper, unload, check and sign the bill of lading as to number of items received, description, weight and for visible or concealed damage. He shall examine this material when it is received. If any damage is found or if any items are missing from shipment that are called for on carrier's delivery ticket all shall be immediately called to the attention of carrier's agent. Notations of such damage or shortages shall be made on the delivery ticket or bill of lading, or in any other manner in accordance with the requirements of that particular carrier. General Contractor shall obtain the signature of carrier's agent to this notation of damage or shortage. Such papers and notations shall then be delivered to BSRO immediately to enable BSRO to file necessary claim. In the event such damages or shortages are not noted then it shall be contractor's obligations to furnish new items of equal quality to complete the project.
- B. General Contractor shall advise and confirm exact street address and postal zip code for deliveries.
- C. New Store orders for Direct TV are placed 45 days before the store opening date.
  - 1. Direct TV National Accounts Call Center – 800.496.4915; Crystal Montoya, 303-264.0021, cmontoya@directv.com ; Reference Bridgestone's primary acct #083053000.
  - 2. Inform the call center you are a New Firestone or Tire Plus store GC and need the bracket to mount the dish. The "account" number is the store's 6-digit number (found on the plan sheets) The Direct TV installer will bring the bracket to the site and tell the GC/super which direction it needs to point. The bracket should NOT be mounted near the store front, building signs, or on building facing "main" drive. NO roof mounts.
  - 3. Per the A7 plan sheet, the GC will mount the bracket to the building and provide a "thru wall" conduit for the Direct TV cable. In jurisdictions where cable conduit is required, the GC will supply.
  - 4. The install of the Direct TV cable and devices will occur after the store is turned over to Operations.
  - 5. If there are bracket placement questions, please contact:
    - a. Byron Clausen  
[bclausen@bfrc.com](mailto:bclausen@bfrc.com)  
817-798-3924

## PART 3 - EXECUTION

### 3.1 SIGNS

- A. Refer to Section 015000 "Temporary Facilities and Controls."
- B. Building mounted signage, as shown on drawings, furnished and installed by BSRO. Contractor shall furnish electrical power to a junction box at the signs shown, final hookup from junction box at the sign by Contractor.
- C. Free standing signs:
  - 1. By Sign Vendor – sign pole foundation and sign by BSRO, unless noted otherwise on plans.
  - 2. By Contractor – electrical power to a junction box at the sign.
  - 3. By Contractor – final hookup of electric to the sign.
  - 4. By Contractor – monument sign foundation and base

## 3.2 EQUIPMENT

- A. Contractor shall install all equipment/fixtures as listed on sheets F1 and F2 in full accordance with the Manufacturer's latest recommendations, operational and functional as intended.

BSRO FURNISHED PRODUCT SCHEDULE					
Delivery	Construction Milestone	Item	Quantity	Installed By:	Vendor
No. 1	Roof Installation Complete. Building Protected from Elements	Key Drop Box	1	Contractor	BSRO
		Tire Shelving	1 Lot	Contractor	Warehouse
		Parts Wire Shelving	1 Lot	Contractor	Warehouse
		Overhead Cord Reel Lights	1 Lot	Contractor	Warehouse
		Overhead Air Hose Reel	1 Lot	Contractor	Warehouse
		Rotary Lifts / Pumps	6	Contractor	Rotary
		Used Oil Tank	1	Contractor	John Dow
		Heavy Duty Cord Reel	2	Contractor	Reelcraft
		Eye Wash	1	Contractor	Ball Chemical
		5 HP Compressor	2	Contractor	Gardner / Denver
		Air Drier	1	Contractor	Champion
		Quick Couplers (10/Box)	1 Lot	Contractor	Warehouse

BSRO FURNISHED PRODUCT SCHEDULE					
Delivery	Construction Milestone	Item	Quantity	Installed By:	Vendor
No. 2	14 Days After Utilities and Parking Lot Completed	Balance of BSRO FFE	1 Lot	Contractor	Warehouse
		MVS Service Desk	1	Contractor	Accel Group
		Customer Service Pod	1 Lot	Contractor	Accel Group
		Power Poles	1 Lot	Contractor	Mono Systems



		Rim Clamp Tire Changer	2	Contractor	Hennessy
		Electronic Wheel Balancer	2	Vendor	Hunter
		Alignment Rack	1	Vendor	Hunter
		Brake Lathe	1	Vendor	Hunter

BSRO FURNISHED PRODUCT SCHEDULE					
Delivery	Construction Milestone:	Item	Quantity	Installed By:	Vendor
No. 3	Schedule As Determined By BSRO	Direct TV bracket mounting & Cable and Devices.	1	Vendor	Direct TV

END OF SECTION 016400



## SECTION 017300 – EXECUTION

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
  - 1. Construction layout.
  - 2. Field engineering and surveying.
  - 3. Installation of the Work.
  - 4. Starting and adjusting.
  - 5. Protection of installed construction.
- B. Related Requirements:
  - 1. Section 011000 "Summary" for limits on use of Project site.
  - 2. Section 017400.10 "Cleaning" for cleaning procedures.
  - 3. Section 017700 "Closeout Procedures" for submitting final property survey with Final Closeout Submittals and recording of Owner-accepted deviations from indicated lines and levels.

## 1.2 INFORMATIONAL SUBMITTALS

- A. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.
- B. Certified Surveys: Submit two copies signed by land surveyor.
- C. Final Property Survey: Submit 10 copies showing the Work performed and record survey data.

## 1.3 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

## PART 2 - PRODUCTS

## 2.1 MATERIALS

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

## PART 3 - EXECUTION

### 3.1 EXAMINATION

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

### 3.2 PREPARATION

- A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 013100 "Project Management and Coordination."

### 3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect and Construction Manager promptly.
- B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.
  - 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
  - 2. Establish limits on use of Project site.
  - 3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
  - 4. Inform installers of lines and levels to which they must comply.
  - 5. Check the location, level and plumb, of every major element as the Work progresses.
  - 6. Notify Architect and Construction Manager when deviations from required lines and levels exceed allowable tolerances.
  - 7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect and Construction Manager.

### 3.4 FIELD ENGINEERING

- A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
- B. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
  - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
- C. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.
- D. Final Property Survey: Engage a land surveyor to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.
  - 1. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

### 3.5 INSTALLATION

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

### 3.6 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

## EXECUTION

- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements"

### 3.7 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with Manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 017300





## SECTION 017400.10 - CLEANING

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section Includes:
  - 1. Cleaning and maintenance of site premises.

## 1.2 REGULATORY REQUIREMENTS

- A. Codes and Standards: Comply with applicable Federal, State and Local codes and regulations relative to environmental safety regulations.
- B. Hazards Controls: Store volatile waste in covered metal containers and remove from premises daily. Prevent accumulation of wastes which create hazardous conditions.
- C. Pollution Control:
  - 1. Do not burn or bury rubbish and waste materials on the project site.
  - 2. Do not disposal of volatile fluid wastes (such as mineral spirits, oil or paint thinner) in storm or sanitary sewer systems or into streams or waterways.
  - 3. Do not disposal of any toxic chemicals in storm or sanitary sewer systems. Comply with EPA requirements regarding disposal.

## 1.3 SUBMITTALS

- A. Product Data: For cleaning agents.

## PART 2 - PRODUCTS

## 2.1 CLEANING MATERIALS

- A. Use only cleaning materials recommended by Manufacturer of surface to be cleaned.
- B. Use cleaning materials only on surfaces recommended by cleaning material Manufacturer.
- C. Cleaning materials shall be clearly labeled and safely stored when not in use. Maintain control of cleaning materials while in use. Do not leave unattended. No flammable materials or liquids may be stored in the existing building or in the new addition.

## PART 3 - EXECUTION

## 3.1 CLEANING REQUIREMENTS

- A. Oversee cleaning and ensure that building and grounds are maintained free from accumulations of waste materials and rubbish.
- B. In exterior work, sprinkle dusty debris with fine water mist to control accumulation of dust. Avoid puddling.
- C. Vacuum clean interior building areas when ready to receive finish painting and continue vacuum cleaning on an as-needed basis until building is ready for acceptance or occupancy.
- D. Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not fall on wet, newly painted surfaces.

- E. Clean exterior premises daily. Do not let debris enter customer areas.

### 3.2 TRASH REMOVAL

- A. On a daily basis, clean work areas and access, and dispose of waste materials, rubbish and debris.
- B. Perform segregation of waste materials into the various classification and segregated materials.
- C. Do not allow waste materials, rubbish and debris to accumulate and become an unsightly or hazardous condition.
- D. Keep streets and access to site free of rubbish and debris.

### 3.3 PROGRESS CLEANING

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

### 3.4 FINAL CLEANING

- A. Execute final cleaning prior to final inspection as follows:
1. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
  2. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
  3. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
  4. Remove tools, construction equipment, machinery, and surplus material from Project site.
  5. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
  6. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
  7. Clean debris from roofs, gutters, downspouts, and drainage systems.
  8. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
  9. Vacuum clean all interior floor surfaces.
  10. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
  11. Remove labels that are not permanent.
  12. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
  13. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint, and mortar droppings, and other foreign substances.
  14. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
  15. Replace disposable air filters and clean permanent air filters of equipment operated during construction. Clean exposed surfaces of diffusers, registers, and grills.
  16. Clean ducts, blowers, and coils if units were operated without filters during construction.
  17. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures.
  18. Leave Project clean and ready for occupancy.
- B. Cleaning of Toilets Prior to Possession:
1. Immediately prior to possession, clean toilets thoroughly including each toilet fixture and accessory.
  2. Clean entire wall and floor surfaces using cleaning solutions and wipe dry to prevent surface film or residue.
  3. Clean water closets and sinks with scrubbing cleansers to remove stains and deposits.
  4. Clean and polish stainless steel accessories and toilet partitions to a spotless luster using soap, ammonia, or mild detergent and water. Apply with sponge or soft cloth, rinse with clear water, and wipe dry. As an alternate, use a commercial stainless-steel cleaner and polish.
  5. Clean mirror surfaces using glass cleaner.
- C. Employ skilled workmen for final cleaning.
- D. Prior to final completion or Owner possession, conduct an inspection of sight-exposed interior and exterior surfaces and all work areas with the Owner to verify that entire Work is clean.

END OF SECTION 017400.10



## SECTION 017419 – CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

## 1.2 SUMMARY

- A. This section includes procedural requirements for the following:
  - 1. Salvaging non-hazardous construction waste.
  - 2. Recycling non-hazardous construction waste.
  - 3. Disposing of non-hazardous construction waste.
- B. The contractor is recommended, but not required, to follow these procedures.

## 1.3 DEFINITIONS

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

## 1.4 INFORMATIONAL SUBMITTALS

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

## 1.5 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

- B. Waste Management Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Administrative Requirements." Revise methods and procedures related to waste management.
  - 1. The contractor is recommended to review procedures for periodic waste collection and transportation to recycling and disposal facilities.
  - 2. Review waste management requirements for each trade.

## PART 2 - PRODUCTS

## NOT USED

## PART 3 - EXECUTION

### 3.1 PLAN IMPLEMENTATION

- A. General: The Contractor is recommended, but not required, to implement waste management plan. Provide handling, containers, storage, signage, transportation and other items to implement waste management plan during the entire duration of the Contract.
- B. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
  - 1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
  - 2. Comply with Division 1 Sections for controlling dust and dirt, environmental protection, and noise control.

### 3.2 SALVAGE

- A. Owner's Salvage: Clean, store, and transfer designated materials and equipment to Owner, and obtain receipt. Owner's salvage items include but are not limited to:
  - 1. Salvage items as indicated on Drawings.
- B. Contractor's Salvage:
  - 1. Contractor shall verify with and obtain approval from Owner's Construction Manager for all Contractor salvage items prior to their removal from site.
  - 2. Transport salvaged items from site as items are removed.
  - 3. Storage or sale of removed items on site not permitted.

### 3.3 RECYCLING CONSTRUCTION WASTE, GENERAL

- A. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to contractor.
- B. Procedures: Separate recyclable waste by type at Project site to the maximum extent practical.

### 3.4 DISPOSAL OF WASTE

- A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
  - 1. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

- B. Burning: Do not burn waste material.
- C. Disposal: Transport waste materials off Owner's property and legally dispose of them.

END OF SECTION 017419





## SECTION 017700 - CLOSEOUT PROCEDURES

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
  - 1. Substantial Completion procedures.
  - 2. Final completion procedures.
  - 3. Warranties.
  - 4. Repair of the Work.
- B. Related Requirements:
  - 1. Section 013233 "Photographic Documentation" for submitting final completion construction photographic documentation.
  - 2. Section 016400 "Owner Furnished Products" for warranty and operation and maintenance manual requirements.
  - 3. Section 017400.10 "Cleaning" for cleaning of Project site.
  - 4. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.
  - 5. Section 017900 "Demonstration and Training" for requirements for instructing Owner's personnel.
  - 6. Section 313116: Termite Control: Field report requirements.

## 1.3 ACTION SUBMITTALS

- A. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- B. Certified List of Incomplete Items: Final submittal at Final Completion.

## 1.4 CLOSEOUT PROCEDURES

- A. The maximum amount of time allowed from date of Substantial Completion to completed Closeout Requirements is 60 days.

## 1.5 CLOSEOUT DOCUMENTS FOR OWNER FURNISHED EQUIPMENT

- A. Warranties:
  - 1. Assemble documents from Subcontractors, suppliers, and Manufacturers.
  - 2. For equipment put into use with Owner's acceptance during construction, submit within ten days after first operation, listing date of acceptance as start of warranty period.

3. For items of Work delayed materially beyond Date of Substantial Completion, provide updated submittal within ten days after acceptance, listing date of acceptance as start of warranty period.
- B. Operation and Maintenance Manuals: Descriptive literature, maintenance and operation data, and parts lists for each item of equipment provided under this Contract that will require maintenance or special operating procedures, including drawings, instructions, or manuals supplied with equipment furnished by others and installed under this Contract.

## 1.6 ELECTRONIC CLOSEOUT DOCUMENT SUBMISSION

- A. Submit Electronic Closeout Documents electronically through Owner's approved online system. Documents included in Electronic Closeout Document Submission shall consist only of the items in the following numbered list. Note that all closeout documents are not necessarily included in the Electronic Closeout Document Submission. If any item listed below is not applicable, include a "Not Applicable" sheet within the uploaded section of the Electronic Closeout Document Submission. The Electronic Closeout Document Submission shall not be compiled based only on the brief description of each item in the following list. It is compulsory that the individual Sections and references be examined to comprehend the full description of the specific item to be included. Include the following:
  1. Section 013233: Photographic Documentation:
    - a. Digital Images: Submit digital still images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
    - b. Date and Time: Include date and time in filename for each image.
    - c. Format: Submit a sortable/identifiable archive of all digital still images on an external hard drive or DVD format.
  2. Section 016400: Owner Furnished Products:
    - a. Warranties.
    - b. Operation and Maintenance Manuals.
  3. Section 017823: Operation and Maintenance Data:
    - a. Maintenance Data Sheet.
  4. Section 017900: Demonstration and Training:
    - a. Store Manager's Record Letter of Receipt.
    - b. Contractor's Record Letter of Certification - Start-Up Systems Demonstration and Training.
    - c. Irrigation Contractor's Record Letter of Certification – Irrigation System Demonstration and Training.
  5. Section 313116: Termite Control:
    - a. Field report for pest control.
  6. As-Built Drawings: Building, Civil, and Alarms.
  7. Certificates of Release: From authorities having jurisdiction.
  8. Contractor's Statement of Warranty (Located at the end of this Section).
  9. Copy of Temporary and/or Final Certificate of Occupancy.
  10. Final Property Survey: Record Owner-accepted deviations from indicated lines and levels.
  11. HVAC Test and Balance Report.
  12. Operation Manuals.
  13. Project Closeout Form (located at the end of this Section).
  14. Project Photographs, Including Nighttime Sign Images.
  15. Start-Up of Systems and Training Certification.
  16. Waivers: Full and final unconditional waivers, delivered prior to or at the time of final disbursement of funds by Owner or Construction Escrow Agent.
  17. Warranties:
    - a. Subcontractor Warranty Letters on Bridgestone Retail Operations Form.

- b. Manufacturer's Warranties.
- c. Roofing (Section 075423).
- d. Rotary Lifts.
- e. Joint Sealants (Section 079200).
- f. Hollow Metal Doors and Frames (Section 081113).
- g. Sectional Doors (Section 083613).
- h. Aluminum-Framed Storefronts (Section 084313).
- i. Door Hardware (Section 087100).
- j. Glazing (Section 088000).
- k. Acoustical Panel Ceilings (Section 095113).
- l. Resilient Flooring (Section 096500).
- m. Painting and Coating (Section 099000).
- n. Electric Water Cooler.
- o. Water Heater.
- p. HVAC Equipment.
- q. Electrical.
- r. Cast-in-Place Concrete (Section 033000).
- s. Asphalt Paving.
- t. Infrared Tube Heaters.
- u. Fire Alarm System.
- v. Plumbing.
- w. Concrete Sealer (Section 033500).

- B. All closeout documents are to be uploaded to the appropriate section within Lucernex.

#### 1.7 PROJECT RECORD DOCUMENTS

- A. Maintain on site, one set of the following record documents. Record actual revisions to the Work.
  - 1. Contract Drawings (Building and Civil).
  - 2. Specifications.
  - 3. Addenda.
  - 4. Change Orders and other Modifications to the Contract.
  - 5. Reviewed shop drawings, product data, and samples.
- B. Maintain Record Documents separate from documents used for construction.
- C. As-Built Record Documents and Shop Drawings: Record as-builts shall be maintained and submitted for the primary purpose of recording the locations for concealed interior and exterior underground utilities as specified in the individual Sections. Legibly record actual measured horizontal and vertical locations of interior and exterior underground utilities and appurtenances, referenced to permanent surface improvements.
- D. Record required as-built information concurrent with construction progress. Do not permanently conceal work until required information has been recorded.
- E. At Project completion, the Contractor shall provide two (2) complete hard copies and one electronic disc set of as-built Drawings to the Owner representative.

#### 1.8 WARRANTIES AND BONDS

- A. Contractor's Statement of Warranty:

1. Provide warranty for a period of one (1) year from the date of store opening, or as noted in the Contract Documents.
2. Eleven (11) months from the date of store opening, Contractor shall conduct a final warranty walk-thru of the project to identify items remaining to be corrected. No additional fees will be paid the Contractor for this walk-thru visit.

1.9 POST ADAAG STORES ADA CONSENT DECREE COMPLIANCE CERTIFICATION PROGRAM

- A. Comply with all requirements from the forms below for ADAAG store compliance.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION 017700

## [CONTRACTOR'S LETTERHEAD]

**CONTRACTOR'S STATEMENT OF WARRANTY**

The Undersigned ("Contractor") hereby warrants that Work we have installed at the Firestone Store at the following location:

---

(Street Address)

---

(City, State)

has been completed strictly in accordance with the Plans and Specifications listed on Exhibit A attached hereto and made a part hereof (collectively, the "Plans").

The Contractor agrees to repair or replace, or cause to be repaired or replaced, at Contractor's sole cost, any defect in workmanship or materials in the Work described in the Plans (the "Work"), together with any adjacent work which requires repairs or replacement due to defects in the workmanship or materials of the Work, which is discovered within \_\_\_\_\_ years after the later of (1) the date Owner opens its store to the public or (2) the date of final acceptance by the Owner of the Work. This warranty does not cover ordinary wear and tear, or unusual abuse or neglect by the Owner.

The Contractor agrees to commence to repair or replace any defective portion of the Work for which it is responsible under this Agreement / Letter within ten (10) days after receipt by Contractor of written notice from Owner and thereafter diligently pursue such repair or replacement to completion. If Contractor fails to comply with the terms of this Letter then Contractor authorizes Owner to proceed to make such repairs and/or replacements at Contractor's cost and expense and Contractor agrees to pay to Owner upon demand all costs incurred by Owner in making all such repairs and/or replacements together with interest at twelve percent (12%) per annum but not to exceed the maximum amount permitted by law. If Owner brings an action against Contractor to enforce the warranty contained herein, Contractor agrees to pay Owner's reasonable attorney's fees and costs in connection therewith.

---

(Sub-Contractor's Signature)

---

(Date)

---

(Countersigned by General Contractor)

---

(Date)

(a) The General Contractor shall jointly execute the warranty form and countersign the above.

(b) The General Contractor and all Sub-Contractors shall fill out, date, sign, and forward all equipment warranties on portions of the Work and send such warranties along with two (2) copies to Owner's Project Manager.



**BSRO PROJECT CLOSEOUT FORM**

CLOSEOUT DOCUMENT	APPLICABLE SPECIFICATION SECTION	YES	NO	COMMENTS
Copy of Temporary and/or Final Certificate of Occupancy Uploaded to Lucernex	---			
Substantial Completion Punchlist Showing Items Completed and Approved by BSRO	---			
Subcontractor Warranty Letters on BSRO Operations Form Only – Reviewed and Uploaded to Lucernex	---			
Manufacturer Warranty Information Reviewed and Uploaded to Lucernex	---			
Operation Manuals Reviewed and Uploaded to Lucernex	---			
Maintenance Data Sheet Completed, Verified, and Uploaded to Lucernex	SECTION 017823 OPERATION AND MAINTENANCE DATA			
HVAC Test and Balance Report Reviewed and Uploaded to Lucernex	---			

**CLOSEOUT PROCEDURES**

CLOSEOUT DOCUMENT	APPLICABLE SPECIFICATION SECTION	YES	NO	COMMENTS
As-built Drawings (Building, Civil, and Alarms) Uploaded to Lucernex	---			
As-built Drawings (Building, Civil, and Alarms) Digital Disc Sent to Rocco Spizzirri (RSpizzirri@bfrc.com)	---			
Completed Work Under Any Maintenance and/or Operations Bonds is Applicable	---			
Final Project Status Report (PSR) by Third Party Inspector Updated and Confirmed that All Open or Pending Items on Final Report by Third Party Inspectors has been Completed and Verified by BSRO Zone Construction Manager	---			
Start-Up of Systems and Training Certification Verified and Uploaded to Lucernex	SECTION 017900 DEMONSTRATION AND TRAINING			



CLOSEOUT DOCUMENT	APPLICABLE SPECIFICATION SECTION	YES	NO	COMMENTS
Completed Project Photographs, Including Night Time Sign Images, Uploaded to Lucernex	SECTION 013233 PHOTOGRAPHIC DOCUMENTATION			
Final General Contractor Pay Application Received for Processing with All Subcontractor Final Waivers Reviewed and Approved for Disbursement	010000			

**Post-ADAAG Stores**

**ADA Consent Decree Compliance Certification Program**  
***(For BFRC stores which had first occupancy of any type after 1/26/93)***

**Table of Contents**

**Introductory Materials**

Instructions to Contractor  
Accessibility Concepts

**Forms**

Post-ADAAG Store – Contractor ADA Compliance Certification Form  
Post-ADAAG Store – BFRC Representative Non-Compliant Issues Resolution Form

**BFRC Post-ADAAG Stores ADA Consent Decree Compliance Certification Program**

Dear Contractor,

The information you provide is critical to assuring that BFRC facilities are in compliance with the BFRC Americans with Disabilities Act Consent Decree requirements. You will be verifying that at the time of your inspection you have recorded the true and accurate conditions of the items indicated on the Contractor ADA Compliance Certification Form.

**1. Initial Inspection**

- a. Tools needed include:
  - Clip Board
  - Pencil with eraser and black pen (erasable type suggested)
  - Post-ADAAG Store BFRC Contractor ADA Compliance Certification Form (attached)
  - Tape measure (24' minimum length, retractable 'lever-lock' recommended)
  - 24" Digital SMARTTOOL or 24" level
- b. Answer questions by checking-off appropriate boxes and writing comments in pencil.
- c. Take measurements to within 1/8".
- d. Several initial questions require making a determination as to whether an "accessible route" exists. When answering these questions, you must be aware of the accessibility features required for an accessible route as described on that page.

**2. Review and Revise**

- a. Review any negative answers with your BFRC representative and request a change order to make any necessary accessibility enhancements to the facility.
- b. Complete any accessibility enhancements approved by the BFRC representative and revise the certification form accordingly.
- c. Review any remaining negative answers with your BFRC representative.
- d. Finalize the report, completing it in black ink pen and assuring that:
  - each question is answered
  - the store # is written at the top of each page
  - all information, including comments, is legible
  - all comments are adjacent to the question they refer to
- e. Make a copy for your records as you may need to refer to it if there are any questions.
- f. Submit the original to your BFRC representative.

**Accessibility Concepts**

**Accessible Route** – For a BFRC store to be accessible and usable, elements addressed in Part A – Accessible Route, must be connected by an *accessible route* that meets the criteria described on the compliance form.

**Range of Reach** – Many people who are of short stature or who use wheelchairs cannot reach as high as an average size standing person.

**Restroom Turn Around Space** – An appropriate size circular or "T" turn clear floor space will allow most wheelchairs to easily turn around. While a circular turn is generally preferred, a "T" turn may often be more easily identifiable.

**Closed Fist/Flail Hand** – People with arthritis, hand injuries or amputations, or high spinal cord injuries often may have difficulty making (or may not be able to make) a tight grip, pinching, twisting their wrist or making fine finger movements. If a device can be operated with your hand formed into a loosely clenched fist or open (flail) hand with the thumb against the palm, most people should be able to operate it.

**Measuring Slope** – Use the digital slope meter or a level and tape measure to determine both front/back and cross slopes along the approximate longitudinal center line, near the top, middle and bottom. If either the average or any two of the three measurements for front/back or cross slope exceeds the Allowable Tolerance, that slope condition will be considered non-conforming.

**BFRC Post-ADAAG Stores Contractor ADA Compliance Certification Form**

*(This form may only be utilized for BFRC stores which had first occupancy of any type after 1/26/93)*

**Inspection Date:** \_\_\_\_\_**Store Number:** \_\_\_\_\_**Store Address:** \_\_\_\_\_  
\_\_\_\_\_**Store Phone #:** \_\_\_\_\_**Store Manager on Duty Signature (Required):** \_\_\_\_\_**Inspector Name (Print):** \_\_\_\_\_**Contractor Co:** \_\_\_\_\_**Contractor Phone:** \_\_\_\_\_**Inspector Signature (Required):** \_\_\_\_\_**Store Type:** Pre-ADAAG \_\_\_\_\_  
(Check one) Post-ADAAG \_\_\_\_\_**Inspection Results:** Full Compliance \_\_\_\_\_  
(Check one) Non-Compliant Issues \_\_\_\_\_**Date:** \_\_\_\_\_

---

**Instructions for Completing the BFRC Contractor ADA Compliance Certification Form:**

1. If the store does not have a specific feature, check the NA box.
2. For each question that can be answered, check Y for yes or N for no.
3. Any question answered "No" must be reviewed with your BFRC representative.
4. Use a calibrated 24" long slope meter or 24" long level and tape measure to determine slopes along the approximate longitudinal center line, near the top, middle and bottom, for both front/back slope and cross slope. If either the average or any two of the three measurements for front/back or cross slope exceeds the Allowable Tolerance, that slope condition will be considered non-conforming.

**Factual Information Requirements****Not in Ownership or Direct Control of BFRC (C)**

Examples could include:

- Pay telephones.
- Vending machines.
- Parking lots.

**Restroom Structural, Plumbing, or Electrical Issues (D)**

Provide a photo(s) of the restroom interior and a description of the work that would be required. Examples could include:

- Wall would need to be moved.
- In-wall plumbing or electrical would need to be relocated.
- In-floor waste line plumbing would need to be relocated.

**Historic Preservation (H)**

Provide a photo(s) and written documentation confirming:

- Building is listed/eligible for the National Register of Historic Places, or
- Building is designated as historic under State or local law.

**Structural Impracticality, Technically Infeasible, or Virtually Impossible (I)**

Provide a photo(s) and/or drawing(s), plus a written explanation indicating the condition(s). Examples could include:

- A structural column would need to be relocated.
- A bearing wall would require substantial modification.
- The site size is small and regrading paved areas is not possible.
- An electric panel board would require relocation.
- No additional space is available.

**No Barrier Exists (N)**

Provide specific written reference to:

- The Consent Decree Exhibit 4 Tolerances List.
- A Federal District or higher court ruling, sanction or documentation addressing the issue.

**Loss of Selling Space (S)**

Provide a photo(s) and/or drawing(s), plus a written explanation indicating the condition. Examples could include:

- Modifications would substantially limit tire displays.

**Significant Risk to Health or Safety (R)**

Provide a photo(s) and/or drawing(s), plus a written explanation indicating the risk issues(s). Examples could include:

- A curb ramp would be at a heavily trafficked drive lane.
- An accessible parking space aisle would be located at a loading zone area.

**Conditional Permit (Z)**

Provide written documentation confirming that:

- The building authority would require extraordinary additional work.
- The building authority would require changes that adversely affect the nature of the business.

**Post-ADAAG Stores – BFRC Representative Non-Compliant Issues Resolution Form***(This form may only be utilized for BFRC stores which had first occupancy of any type after 1/26/93)***Store Number:** \_\_\_\_\_**Store Address:** \_\_\_\_\_  
\_\_\_\_\_**BFRC Representative: (Print/Sign)** \_\_\_\_\_ **Date:** \_\_\_\_\_

Q #	• NC Code	Describe why compliance is not possible.	Describe any alternative measure(s) being taken.	Fact Info. Attached Y/N	Photo Attached Y/N

	BFRC Survey Questions version 4.8.02 1.0- PostADAAG.XLS				
--	---	--	--	--	--

		Y	N	NA	Comments
	<b>A. ACCESSIBLE ROUTES</b> <i>An accessible route at a Post-ADAAG Store must meet the following:</i> <i>Width: 35" min/32" min for 36" length</i> <i>Vertical Breaks: 1/4" high max if non-beveled, or 3/4" high max if beveled, or curb ramp or ramp</i> <i>Horizontal Breaks: 3/4" max perpendicular to path</i> <i>Protruding Objects Horizontal: 5" max from wall/12" max from post</i> <i>Protruding Objects Vertical: 78" min above finished floor</i>				
1.	Is there an accessible route from the store property line to at least one pay telephone?				
2.	Is there an accessible route from the store property line to each accessible parking space access aisle?				
3.	Is there an accessible route from the store property line to at least one accessible customer entry door?				
4.	Is there an accessible route from an accessible customer entry door to at least one accessible customer service counter?				
5.	Is there an accessible route from an accessible customer entry door to each accessible customer restroom door?				
6.	Is there an accessible route from an accessible customer entry door to at least one accessible customer drinking fountain?				
7.	Is there an accessible route from an accessible customer entry door to at least one courtesy coffee station?				
8.	Is there an accessible route from an accessible customer entry door to and along each merchandise display aisle?				
9.	Is there an accessible route from an accessible customer entry door to at least one of each type vending machine?				
10.	Is there an accessible route from an accessible customer entry door to at least one waiting area?				
	<b>B. PARKING</b>				
11.	Are the correct numbers of accessible parking spaces provided?				
	1 – 25 parking spaces = 1 accessible space				



	26 – 50 parking spaces = 2 accessible spaces				
	51 – 75 parking spaces = 3 accessible spaces				
12.	Is each accessible parking space at least 94" wide?				
13.	Does each accessible parking space have an access aisle at least a 94" wide, OR is the combined width of each accessible parking space and adjacent access aisle at least 188" wide?				
14.	Does each accessible parking space have an upright sign which contains the international symbol of accessibility?				
15.	Is each parking space sign located so as not to be obstructed by parked vehicles?				
16.	Does each accessible parking space and access aisle have front/back and cross slopes that do not exceed 3%? <sup>1</sup>				
	<b>C. CURB RAMPS &amp; RAMPS</b>				
17.	Is each curb ramp or ramps which are part of a required accessible route at least 35" wide?				
18.	Is the front to back slope of each curb ramp or ramp which is part of a required accessible route no steeper than 13% if the rise is 3" high or no steeper than 9% if the rise is over 3" h ? <sup>1</sup>				
19.	Is the cross slope of each curb ramp or ramp which is part of a required accessible route no greater than 3%? <sup>1</sup>				
20.	Are the transitions ( <i>i.e.</i> , lips) at the top and base of each curb ramp or ramp which is part of a required accessible route, smooth or no more than 1/2" high if beveled?				
21.	Is the top landing at least 46" long at each curb ramp or ramp which is part of a required accessible route?				
22.	Are handrails provided on both sides of each ramp whose rise exceeds one step?				
23.	Are the tops of handrails at ramps between 33" and 39" above the ramp surface?				
24.	Are 10" minimum long horizontal extensions provided at the top and bottom of each ramp handrail?				
25.	Is the diameter of each ramp handrail gripping surface between 1 1/4" - 2"?				
	<b>D. CUSTOMER ENTRY DOOR</b>				

26.	Is the net clear width of one door leaf when open 90° at least 31 3/8" at each customer entry that is on an accessible route?				
27.	Is the pull side clear floor area maneuvering space at least 17" wide beyond the strike of each customer entry door that is on an accessible route?				
28.	Is the pull side maneuvering space at least 59" deep for front approach or 48" deep for side approach at each customer entry door that is on an accessible route?				
29.	Is the push side maneuvering clearance at least 10" wide beyond the strike of each customer entry door that is on an accessible route, if there is both a closer and a latch on the door (or 0" required beyond the latch if not <u>both</u> a closer and a latch)?				
30.	Is the push side maneuvering space at least 48" deep for front approach or 42" deep for side approach at each customer entry door that is on an accessible route?				
31.	Is the threshold no higher than ¼" vertical or ½" and beveled at each customer entry door that is on an accessible route?				
32.	Are the handles operable with a closed fist or flail hand at each customer entry door that is on an accessible route?				
33.	Is the slope of the maneuvering space no steeper than 3% in any direction at the exterior side of each customer entry door that is on an accessible route?				
34.	If all customer entry doors are not accessible, is there a sign with the ISA (International Symbol of Accessibility) at each accessible entry door and an ISA sign with a directional arrow at each non-accessible customer entry door, directing customers to an accessible door?				
	<b>E. SALES AREA</b>				
35.	Is the clear floor area at least 29" x 47" at one customer service counter on an accessible route?				
36.	Is the writing surface no higher than 37" or is there a portable writing surface at each customer service counter?				
37.	Is the clear floor area at least 29" x 47" in front of at least one coffee station (if one exists)?				
	<b>F. CUSTOMER RESTROOM</b>				

38.	Is there a high-contrast low-glare sign with raised (tactile) letters and Braille centered at a height of 58"-62" on the wall beside each restroom door, or on the door if in-swinging?				
39.	Are the restroom entry door handles operable with a closed fist or flail hand?				
40.	Can the lock on each restroom entry door be operated with a closed fist or flail hand?				
41.	Is the net clear opening at least 31 3/8" wide at each restroom entry door?				
42.	Is the threshold no higher than 1/4" or 1/2" and beveled at each restroom entry door?				
43.	Is the pull side clear floor area maneuvering space at least 17" wide beyond the strike of each restroom entry door?				
44.	Is the pull side maneuvering space at least 59" deep for front approach or 48" deep for side approach at each restroom entry door?				
45.	Is the push side maneuvering space at least 10" wide beyond the strike of each restroom entry door if there is both a closer and a latch on the door (or 0" required beyond the strike if not both a closer and a latch)?				
46.	Is the push side maneuvering space at least 48" deep at the restroom entry door?				
47.	Is the side wall grab bar at least 42" long and within 12" of the rear wall at each accessible water closet?				
48.	Is the rear wall grab bar at least 36" long (24" if wall space restricted by a lavatory) and within 8" of the side wall at each accessible water closet?				
49.	Is the center line of the grab bars between 32"-37" high at each accessible water closet?				
50.	Is the diameter of the grab bars 1 1/4" – 1 1/2" at each accessible water closet?				
51.	Is there 1 1/2" clearance between the grab bars and the wall at each accessible water closet?				
52.	Does each accessible water closet have a seat between 17"-20" high?				
53.	Does at least one lavatory have knee space that is at least 27" high (excluding the overflow) from the front edge to 8" back from the front edge and a top height no greater than 35"? <sup>2</sup>				
54.	Are the accessible lavatory pipes insulated or configured to protect from contact?				

## CLOSEOUT PROCEDURES

55.	Are faucet controls at the accessible lavatory operable with a closed fist or flail hand?				
56.	Is the bottom reflecting edge of at least one mirror no higher than 41"?				
57.	Are the highest operable controls on at least one paper towel dispenser (or hand dryer) no higher than 49" if only front approach is possible or 55" if side approach is possible?				
58.	Is at least one soap dispenser no higher than 49" if only front approach is possible or 55" if side approach is possible?				
59.	If the restroom is at least 5'-6" x 7'-6" in size, is there 58" diameter or 58" x 58" T turn space available?				
	<b>G. CUSTOMER PAY TELEPHONES</b>				
60.	Is there a 29" x 47" clear floor area no more than 10" from the face of the controls at one pay telephone that is on an accessible route?				
61.	Does this pay telephone have all controls no higher than 55" if side approach is possible or 49" if only front approach is possible?				
62.	Does this pay telephone have a hearing-aid compatible volume control handset, and a volume control pictogram?				
	<b>H. CUSTOMER DRINKING FOUNTAIN</b>				
63.	Is the spout of one customer drinking fountain at or below a height of 37" or is there an adjacent cup dispenser with round (not pointed) bottom cups at 48"h max?				
<sup>1</sup> Measure along the approximate longitudinal center line, near the top, middle and bottom, for both front/back slope and cross slope. If either the average or any two of the three measurements for front/back or cross slope exceeds the Allowable Tolerance, that slope condition will be considered non-conforming.					
<sup>2</sup> If the lavatory is less than 17" deep (as measured from the lavatory face to the rear wall), measure from a point 17" from the rear wall.					

END OF SECTION

SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes Maintenance Data Sheet requirements.
- B. Related Requirements:
  - 1. Section 017700 "Closeout Procedures": Electronic closeout document submission.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION 017823



**BFS Retail & Commercial Operations, LLC**  
**MAINTENANCE DATA SHEET**  
*All Sections Must be Complete Prior to Final Payment*

<b>Project Name:</b>	<b>Project Ref. No.:</b>	<b>Prepared by:</b>	<b>Preparer's Initials:</b>
<b>Project Address:</b>	<b>Contact:</b>	<b>Contact Phone:</b>	<b>Date Prepared:</b>
<b>Contract Date:</b>	<b>Opening Date:</b>		

**Type of Construction**

**Walls:**

**Roof:** PVC ☐ TPO ☐ EPDM ☐ Metal ☐ Shingle ☐ Other

**Roofing Manufacturer:**

**Warranty Information (Years)**

**Store Type (Check All That Apply)**

- |  |  |   |
|--|--|---|
| <input type="checkbox"/> Free Standing | <input type="checkbox"/> Strip Center  | <input type="checkbox"/> Outlet         |
| <input type="checkbox"/> New Store     | <input type="checkbox"/> Relocation    | <input type="checkbox"/> Remodel        |
| <input type="checkbox"/> Design Build  | <input type="checkbox"/> Build to Suit | <input type="checkbox"/> Self-Developed |

	Company Name	Location:	Business Phone:	Emergency Phone:
Developer:				
General Contractor				
SUBCONTRACTORS				
Electrical:				
Plumbing:				
Fire Protection:				
Roofing:				
HVAC:				
Paving:				
Painting:				
Storefront:				
Earthwork:				
Site Utility:				
	Company Name	Location:	Business Phone:	Emergency Phone:
Striping:				

Landscaping:				
Floor Covering:				
Carpentry:				
Fencing:				
Exterior Concrete:				
Interior Concrete:				
Masonry:				
Overhead Doors:				
Auto Lifts:				
Structural Steel:				

**Heating and Air conditioning Equipment**

**Gas fired** ☐

**Electric Heat** ☐

Quantity	Manufacturer	Model Number	Heat/Cool (BTU's)	Cool Only

**Miscellaneous Information**

Parking Lot Lighting	Manufacturer	Catalog/Model Number	Volts/Watts	Lamp Model Number
Lighting Poles:				
Light Fixtures:				
Ballasts:				
Lamps:				



Parking Lot Lighting	Manufacturer	Catalog/Model Number	Volts/Watts	Lamp Model Number
Fluorescent Mount:				
Ballasts:				
Lamps:				
Exterior Wall Packs				
Ballasts:				
Lamps:				
Exit Lighting				
Emergency Lighting				

***Products***

	Manufacturer	Catalog/Model Number	Color style
Door Closers:			
Panic Hardware:			
Automatic Doors:			
Ceiling Panels			
Floor Tile:			
Rubber:			
VCT:			
Carpet:			
Restroom Partitions:			
Fire Pump:			
Jockey Pump			

Note: Include all information requested, including BSRO Provided Parts.  
DNA: Does Not Apply

END OF FORM 017823



## SECTION 017900 - DEMONSTRATION AND TRAINING

## 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 instructing Owner's personnel, including the following:
  - 1. Demonstration of operation of systems, subsystems, and equipment.
  - 2. Training in operation of systems, subsystems, and equipment.
  - 3. Irrigation Training.
  - 4. Store Manager Record Letter of Receipt.
  - 5. Contractor's Record Letter of Certification.
- B. Related Requirements:
  - 1. Section 017700 – Closeout Procedures: Store Manager's Record Letter of Receipt, Contractor's Record Letter of Certification and Irrigation Contractor's Record Letter of Conformance.

## 1.3 RECORD LETTERS OF CERTIFICATION AND RECEIPT

- A. Attendees will sign the Record Letter of Conformance found at the end of this Section.
- B. The Store Manager will sign the Record Letter of Receipt found at the end of this Section.
- C. The Irrigation Installer will sign the Irrigation Record Letter of Conformance found at the end of this Section.
- D. Submit as required in Section 017700.

## PART 2 - PRODUCTS

## 2.1 DEMONSTRATION AND TRAINING

- A. Systems Start-Up Demonstration and Training Meeting: Conduct a meeting at the Project site to demonstrate and train personnel and required attendees in start-up of systems.
  - 1. Purpose of Meeting:
    - a. Provide personnel an overview of building systems, equipment, and products.
    - b. Intended only to address building operation, not equipment maintenance.
    - c. Questions are welcome at the end of each training section.
  - 2. Meeting Rules:
    - a. Turn cell phones off.
    - b. Stay with the group.

- c. Attempt to keep the training brief.
- 3. Materials Required for Meeting:
  - a. ALTA.
  - b. Paving plan.
  - c. Landscape plan.
  - d. Site lighting plan.
- B. Irrigation Training:
  - 1. The Irrigation Installer and Project Superintendent shall conduct a meeting with the BSRO Store Manager and BSRO Construction Manager to train the Store Manager on the operation of the irrigation equipment.

### PART 3 - EXECUTION

#### 3.1 INSTRUCTION

- A. Contractor shall host the start-up systems training and demonstration and present listed material as required in this Section. Subcontractors shall present listed material as required in this Section.
- B. Scheduling: Provide instruction at mutually agreed on times.
- C. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

#### 3.2 START-UP SYSTEMS TRAINING AND DEMONSTRATION

- A. The General Contractor shall perform the following training responsibilities:
  - 1. General Walk-Through Items.
  - 2. Warranty and Maintenance Process:
    - a. Provide Facilities Maintenance office phone number, cell phone number and email address.
    - b. Make Facilities Maintenance aware of any issues immediately.
    - c. The building has a minimum one-year warranty on all items. This does not cover abuse, maintenance, normal wear, or acts of god, i.e. high winds and floods.
    - d. Provide the contractor list for emergencies only. Follow up with Facilities Management after calling the contractor.
  - 3. Exterior Site:
    - a. Lot boundary lines and access easement areas.
    - b. Asphalt Paving:
      - 1) Locate light duty and heavy-duty areas on Drawings.
      - 2) Do not park heavy vehicles for extended periods of time on light duty asphalt paving.
      - 3) Protect asphalt paving from oil and gas. This will deteriorate the paving since asphalt is a petroleum-based product.
  - 4. Building Exterior:
    - a. Knox Box:
      - 1) Have extra building keys made for Fire Department.
      - 2) Call Fire Department to lock the key in the knox box.
    - b. Pitched Roofs:
      - 1) Never get on roofs.

- 2) Never attach anything to the roof, i.e. banners, displays, etc.
- c. Flat Roofs:
  - 1) Never get on roofs.
  - 2) Never put anything on the roof, i.e. banners, displays, etc. which will void roof warranty.
- 5. Building Interior:
  - a. Flooring:
    - 1) The floor has been waxed and requires maintenance.
    - 2) The flooring can be damaged. Keep clean and free of debris.
    - 3) Do not drag items across the floor. Flooring can become scratched.
  - b. Floor Safe:
    - 1) There is an envelope on the top of the safe with a phone number to call to get the code to the safe.
  - c. Ceiling Tile: Notify Facilities Maintenance if stains are evident. Water leaks may be present.
  - d. Light Fixtures:
    - 1) Insects accumulate in the center light cover. Use caution when cleaning the lights as lights soil easily. Use of new cleaning gloves is recommended.
- 6. Service Area:
  - a. Lifts:
    - 1) Review lift operation as required.
    - 2) Up and down button are used to raise and lower the lift.
    - 3) To lock the lift:
      - a) Raise the lift above the desired height.
      - b) Press the lock button and lower the lift to the locked position with the lock button pressed.
    - 4) To unlock the lift:
      - a) Raise the lift about six (6) inches. The lock will automatically release the lock.
      - b) Lower the lift.
    - 5) Liquid in the Lift Containment Unit:
      - a) Indicated by light between up and down control button.
    - 6) Keep water away from cylinders as much as possible.
  - b. Floor Maintenance: The more the floor is cleaned the glossier it becomes.
  - c. Overhead Doors:
    - 1) Keep areas around doors clear for proper operation.
    - 2) Don't hook safety chains or banners on door tracks.
    - 3) Facilities Maintenance will keep doors balanced. The opening force should be about 25 lbs. Call Facilities Maintenance if doors become too heavy or attempt to close when half open.
  - d. Door Openers:
    - 1) Keep doors in full view when operating automatic doors.
    - 2) Maintain safety edge and wire attachments at all times.
    - 3) Do not use slide locks or padlocks on automatic doors. Remove bolt from slide lock to use padlock if required when the door operator is disengaged.
    - 4) When required, perform manual operation of overhead doors as follows:
      - a) Pull the small single chain.
      - b) Lock the chain into place with tension on the chain. This will engage the manual pull chain.
      - c) Operate the door with the larger pull chain.
      - d) Secure the door at closing with the use of slide locks or by engaging the door opener and checking the door is secure.
      - e) Exhaust port hoses are provided.
- 7. Service Platforms and Storage above Used Tire Storage:
  - a. Don't overload these areas with paper files or heavy items.
- 8. Spare Parts and Maintenance Products:

- a. The following items are stored on the service platform:
    - 1) One (1) gallon of each type of paint used.
    - 2) One (1) case of resilient floor tile.
    - 3) One (1) case of acoustical ceiling tile.
    - 4) Two (2) quarts of compressor oil.
    - 5) One (1) spare set of RTU or air handler filters (pleated type).
    - 6) Two (2) each spare exterior and interior lamps.
  - b. The following items have been given to the Store Manager:
    - 1) Two (2) complete sets of electrical panel keys.
    - 2) Two (2) complete sets of keys for towel dispensers.
    - 3) Two (2) keys for smoker's station.
- B. The applicable Subcontractors shall perform the following training responsibilities and cover the listed topics:
- 1. Landscaping Contractor:
    - a. BSRO is responsible for the total maintenance of the Project site.
    - b. Lawn Care and Fertilization: Provide handout with recommendations.
    - c. Planting Care and Fertilization: Provide handout with recommendations.
    - d. Tree Care and Fertilization: Provide handout with recommendations.
    - e. Irrigation Operation and Recommended Settings: Provide handout with recommendations.
  - 2. Electrical Contractor:
    - a. Keep area in front of electrical panels clear as required by Fire Marshal.
    - b. Electrical Panels:
      - 1) Make sure all panels are labeled.
      - 2) All electrical items are controlled by switches, not the electrical panels.
      - 3) If a breaker is reset and trips, call the Facilities Maintenance immediately.
    - c. Building and Sign Lighting Timer:
      - 1) Timer is attached to a photocell to assist with the operation of lights.
      - 2) Building sign lights are programmed to turn on at a specified time (if photocell allows) and off at a specified time. Specify the actual times.
    - d. Exterior Outlets: Installed on separate circuits for sales display items.
  - 3. Plumbing Contractor:
    - a. Oil Water Separators:
      - 1) Review the location of the oil and water separators.
      - 2) Floor drains and utility sinks drain into this system to separate the oil from the water before entering the sanitary sewer system.
      - 3) Do not flush shop towels or similar items into the oil water separator system.
      - 4) Maintenance: Call BSRO Facilities Maintenance.
    - b. Air Compressor and Dryer:
      - 1) Describe the purpose of the air dryer.
      - 2) Operation of valves to isolate and remove damaged components from air system while allowing the balance of the system to remain in operation.
      - 3) Armstrong trap will create noise when in operation.
  - 4. HVAC Contractor:
    - a. Thermostats:
      - 1) Location.
      - 2) Operation.
    - b. Exhaust Fans and Systems:
      - 1) Carbon Monoxide System:
        - a) Leave the building when the alarm sounds. The system will automatically reset.
        - b) This system only detects carbon monoxide.
        - c) No maintenance is required.
      - 2) Switch or operation for service area exhaust fan.
      - 3) Tire Storage Ventilation System:

- a) Thermostat location.
      - b) Operation and setting of system.
    - c. Air Filter:
      - 1) Location.
      - 2) Changing of filters and intervals.
      - 3) Thermostat operation.
    - d. General Service Guidelines.
    - e. Additional Items
  - 5. Fire Protection Contractor:
    - a. Fire Sprinkler Riser:
      - 1) Do not touch valves.
      - 2) Keep area clear around the fire riser as required by Fire Marshal.
      - 3) Location of spare sprinkler heads and wrench.
      - 4) Describe a dry system if used, and why this system is used in cold climates for attic sprinklers.
      - 5) Compressor for the dry sprinkler system must remain on.
    - b. If the compressor for the dry system runs excessively it is likely to have a leak. Call Facilities Management immediately.
    - c. Additional Items.
  - 6. Fire Alarm Contractor:
    - a. Location.
    - b. General items the Store Manager should be knowledgeable of.
  - 7. Burglar Alarm Contractor:
    - a. Review operation of system with store associates.
- C. Required Attendees:
- 1. Trainer.
  - 2. Subcontractors for all applicable disciplines.
  - 3. Store personnel.

### 3.3 IRRIGATION SYSTEM TRAINING AND DEMONSTRATION

- A. The Irrigation Contractor shall train the required attendees on the following topics:
- 1. Operation of the irrigation timer.
  - 2. Recommended water times and frequencies.
  - 3. Standard maintenance procedures.
- B. Required Attendees:
- 1. BSRO Store Manager.
  - 2. BSRO Construction Manager.
  - 3. Construction Superintendent.
  - 4. Owner Representative.

END OF SECTION 017900

**STORE MANAGER'S RECORD LETTER OF RECEIPT  
SECTION 017900  
DEMONSTRATION AND TRAINING**

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_  
(City)

\_\_\_\_\_  
(State)

Site Identification: \_\_\_\_\_ Store Number: \_\_\_\_\_

**Receipt of Spare Parts and Maintenance Products**

The following items have been received and are stored on the service platform:

- ☐ One (1) gallon of each type of paint used.
- ☐ Two (2) quarts of compressor oil.
- ☐ One (1) spare set of RTU or air handler filters (pleated type).
- ☐ Two (2) each spare exterior and interior lamps.

The following items have been received by the Store Manager:

- ☐ Two (2) complete sets of electrical panel keys.
- ☐ Two (2) complete sets of keys for towel dispensers.
- ☐ Two (2) keys for smoker's station.

The undersigned hereby declares that the items above have been received as declared above.

STORE MANAGER:

\_\_\_\_\_  
(Printed Name of Store Manager) Phone Number: (     ) \_\_\_\_\_

\_\_\_\_\_  
(Signature of Store Manager)



**CONTRACTOR'S RECORD LETTER OF CERTIFICATION  
SECTION 017900  
START-UP SYSTEMS DEMONSTRATION AND TRAINING**

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_  
(City)  
\_\_\_\_\_  
(State)

Site Identification: \_\_\_\_\_ Store Number: \_\_\_\_\_

The undersigned hereby declare that they attended and/or presented BSRO Start-up Systems Demonstration and Training at the above listed location.

Contractors and Subcontractors hereby declare that their respective systems have been started up and tested as of this date, and that the system installation is complete and functional, free of repairs, defective parts or work.

DEMONSTRATION AND TRAINING ATTENDEES:

\_\_\_\_\_  
(Printed Name of General Trainer)

\_\_\_\_\_  
(Signature of General Trainer)

\_\_\_\_\_  
(Company Name and Address)

Phone Number: (     ) \_\_\_\_\_

\_\_\_\_\_  
(Printed Name of Landscape Contractor)

\_\_\_\_\_  
(Signature of Landscape Contractor)

\_\_\_\_\_  
(Company Name and Address)

Phone Number: (     ) \_\_\_\_\_

\_\_\_\_\_  
(Printed Name of Electrical Contractor)

\_\_\_\_\_  
(Signature of Electrical Contractor)

\_\_\_\_\_  
(Company Name and Address)

Phone Number: (     ) \_\_\_\_\_

\_\_\_\_\_  
(Printed Name of Plumbing Contractor)

\_\_\_\_\_  
(Signature of Plumbing Contractor)

\_\_\_\_\_  
(Company Name and Address)

Phone Number: (     ) \_\_\_\_\_

---

(Printed Name of HVAC Contractor)

---

(Company Name and Address)

---

(Signature of HVAC Contractor)

Phone Number: (     ) \_\_\_\_\_

---

(Printed Name of Fire Protection Contractor)

---

(Company Name and Address)

---

(Signature of Fire Protection Contractor)

Phone Number: (     ) \_\_\_\_\_

---

(Printed Name of BSRO Construction Representative)

---

(Company Name and Address)

---

(Signature of BSRO Construction Representative)

Phone Number: (     ) \_\_\_\_\_

---

(Printed Name of BSRO Store Representative)

---

(Company Name and Address)

---

(Signature of BSRO Store Representative)

Phone Number: (     ) \_\_\_\_\_

---

(Printed Name of Owner Representative)

---

(Company Name and Address)

---

(Signature of Owner Representative)

Phone Number: (     ) \_\_\_\_\_

List Additional Attendees Below:

END OF FORM

**IRRIGATION CONTRACTOR'S RECORD LETTER OF CERTIFICATION**  
**SECTION 017900**  
**IRRIGATION SYSTEM DEMONSTRATION AND TRAINING**

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_  
(City)  
\_\_\_\_\_  
(State)

Site Identification: \_\_\_\_\_ Store Number: \_\_\_\_\_

- ☐ Irrigation timer
- ☐ Recommended Water Times and Frequencies
- ☐ Standard Maintenance Procedures

The undersigned hereby declare that they attended and/or presented BSRO Irrigation System Demonstration and Training at the above listed location.

Contractors and Subcontractors hereby declare that their respective systems have been started up and tested as of this date, and that the system installation is complete and functional, free of repairs, defective parts or work.

DEMONSTRATION AND TRAINING ATTENDEES:

(Printed Name of Irrigation Installer)

(Company Name and Address)

(Signature of Irrigation Installer)

Phone Number: (      ) \_\_\_\_\_

(Printed Name of Project Superintendent)

(Company Name and Address)

(Signature of Project Superintendent)

Phone Number: (      ) \_\_\_\_\_

(Printed Name of BSRO Construction Manager)

(Company Name and Address)

(Signature of BSRO Construction Manager)

Phone Number: (      ) \_\_\_\_\_

\_\_\_\_\_  
(Printed Name of BSRO Store Manager)

\_\_\_\_\_  
(Company Name and Address)

\_\_\_\_\_  
(Signature of BSRO Store Manager)

Phone Number: (     ) \_\_\_\_\_

\_\_\_\_\_  
(Printed Name of Owner Representative)

\_\_\_\_\_  
(Company Name and Address)

\_\_\_\_\_  
(Signature of Owner Representative)

Phone Number: (     ) \_\_\_\_\_

List Additional Attendees Below:

END OF FORM

## SECTION 022820 – TERMITE CONTROL

## PART 1 – GENERAL

## 1.1 SOIL

- A. Provide soil treatment for termite control in states that require termite control.
- B. Soil Treatment Materials: Soil treatment materials shall bear Federal registration number of U.S. Environmental Protection Agency and acceptable authorities having jurisdiction. If acceptable, products may include chlorpyrifos, permethrin, cypermethrin, fenvalerate, and isofenphos.
- C. Treat soil in strict compliance with National Pest Control Association standards and with Manufacturer's printed instructions and recommendations.
- D. Treat areas under floor slabs prior to placement of concrete if possible to avoid drilling. Treat areas outside foundation walls after excavation, filling and grading are complete. Do not apply treatment to frozen or excessively wet soils.
- E. Post signs and other warnings indicating that soil poisoning has been applied. Protect persons and property from injury or damage from soil treatment work.

## 1.2 WARRANTY

- A. Submit Manufacturer's standard warranty. Include labor and materials to repair or replace defective materials. Warranty period: 5 years.
- B. Comply with governing codes and regulations. Provide products of acceptable Manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with Manufacturer's instructions.

END OF SECTION



## SECTION 024113 - SELECTIVE SITE DEMOLITION

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section Includes:
  - 1. Procedures for demolition and removal of existing building elements.
  - 2. Protection of existing construction.
  - 3. Salvaged material and items.
  - 4. Schedule of building demolition.
  - 5. Disposal of demolished materials (non-hazardous and hazardous).

## 1.2 SYSTEM DESCRIPTION

- A. Selective Demolition Requirements:
  - 1. Perform demolition in construction sequence phases according to Construction Sequence Drawings.
  - 2. Work necessary and required to facilitate the new construction indicated.
  - 3. Demolish so that construction, new and existing, can be performed and completed in accordance with construction documents.
  - 4. Visit the project site and become familiar with the existing conditions and project requirements.
  - 5. Clarify the scope of the Work under this Section including salvage material. The Owner will be responsible for removing materials and equipment which the Owner wishes to salvage prior to the beginning of this Work.
  - 6. Retain existing fire protection sprinkler system in place and active.
  - 7. Contractor is responsible for damage to existing structure and replacement or repair of damage.
  - 8. Repair, replace, or rebuild existing construction as required or as directed which has been removed, altered, or disrupted to allow for new construction. Correct existing construction to match adjacent construction, new or existing.
- B. Regulatory Requirements:
  - 1. Conform to applicable code for demolition of structures, safety of adjacent structures, dust control, runoff control, and disposal.
  - 2. Obtain required permits from authorities having jurisdiction and submit to Owner.
  - 3. Notify affected utility companies before starting work and comply with their requirements. Submit Certificates for severance of utility services and submit confirmation documentation of all utility company contacts to Owner.
  - 4. Do not close or obstruct roadways, sidewalks, or hydrants without permits from authorities having jurisdiction and Owner.
  - 5. Conform to applicable regulatory procedures when discovering hazardous or contaminated materials.

## 1.3 PROJECT CONDITIONS

- A. Conditions of Structure:
  - 1. Owner assumes no responsibility for actual condition of items or structures to be demolished.
  - 2. Conditions existing at time of inspection for bidding purposes will be maintained by Owner insofar as practical.
  - 3. Variations within structure may occur by Owner's removal and salvage operations prior to start of selective demolition work.
- B. Scope of Demolition Work:
  - 1. Demolition includes existing improvements indicated on Civil or Architectural Drawings, including but not limited to buildings, sheds, and septic tanks.
  - 2. Demolition includes items visible from the surface of the ground or identified in the geotechnical

- report required to be removed for construction of the Work, including but not limited to trees, culverts, and existing debris.
3. Demolition includes soil remediation and rock removal work as recommended or reasonably construed from the log of borings.
  4. Rock Excavation (if required): Igneous, metamorphic, or sedimentary rock which cannot be removed by rippers or other mechanical methods, and requires drilling or blasting to remove.
    - a. Excavation and disposal of rock excavation included in the Soils Report shall be considered unclassified excavation and included with earthwork grading as part of the lump sum base bid.
    - b. Rock Excavation Not Indicated in the Soils Report: Notify Owner's Construction Manager prior to rock excavation.
      - 1) Determine an estimated removal quantity.
      - 2) Receive written verification from Owner's Construction Manager prior to proceeding with excavation.
      - 3) Contact Owner's Construction Manager if estimated quantity is exceeded. Revise the estimated quantity and receive written authorization to proceed with excavation.
      - 4) Payment for the authorized Work shall be by Change Order to the Contract based upon established cubic yard pricing with the volume of removal verified by reverse topography.

#### 1.4 QUALITY ASSURANCE

- A. Qualifications: Engage only personnel who can demonstrate not less than five (5) years successful experience in Work of similar character.
- B. Performance Criteria:
  1. Requirements of Structural Work: Do not cut structural work in a manner resulting in a reduction of load-carrying capacity of load/deflection ratio.
  2. Operational and Safety Limitations: Do not cut operational elements and safety-related components in a manner resulting in a reduction of capacities to perform in a manner intended or resulting in a decreased operational life, increased maintenance, or decreased safety.
  3. Visual Requirements: Do not cut work which is exposed on the exterior or exposed in occupied spaces of the building in a manner resulting in a reduction of visual qualities or resulting in substantial evidence of the demolition work judged by the Architect to be cut and patched in a visually unsatisfactory manner.
  4. Loading: Do not superimpose loads at any point upon existing structure beyond design capacity including loads attributable to materials, construction equipment, demolition operations, and shoring and bracing.
  5. Vibration: Do not use means, methods, techniques, or procedures which would induce vibration into any element of the structure.
  6. Fire: Do not use means, methods, techniques, or procedures which would produce any fire hazard.
  7. Water: Do not use means, methods, techniques, or procedures which would produce water run-off, and water pollution.
  8. Air Pollution: Do not use means, methods, techniques or procedures which would produce uncontrolled dust, fumes, or other damaging air pollution.

#### 1.5 OWNER RESPONSIBILITIES

- A. Employment and payment for services of a Construction Testing Laboratory (CTL) and/or Special Inspector (SI) to perform specified testing and inspecting will be by Owner under separate contract.

#### 1.6 UTILITY SERVICES

- A. Maintain existing utilities. Keep in service and protect against damage during demolition operations.
- B. Do not interrupt existing utilities serving occupied or used facilities except when authorized in writing by



authorities having jurisdiction and approval by Owner.

- C. Provide temporary services during interruptions to existing utilities as acceptable to governing authorities.
- D. Locate, identify, stub off, and disconnect utility services not to remain.
- E. Provide by-pass connections as necessary to maintain continuity of service to occupied areas of building.
- F. Provide advance notice to Owner if shut-down of service is necessary during change-over.

## 1.7 PROJECT SITE

- A. Indicated "Existing Construction" was obtained from existing drawings. Verify existing conditions and notify the Owner of discrepancies before proceeding with the Work.
- B. Perform removal, cutting, drilling, etc., of existing work with extreme care, and use small tools in order not to jeopardize the structural integrity of the building.
- C. Condition of Structure: The Owner assumes no responsibility for the actual condition of portions of the structure to be demolished.
- D. Protection: Ensure that the safe passage of persons around the area of demolition is provided. Conduct operations to prevent damage to adjacent buildings, structures, and other facilities, and injury to persons.

## 1.8 SEQUENCING AND SCHEDULING

- A. Comply with Owner's approved schedule for sequence of operations for selective demolition work.
- B. Include coordination for shut-off, capping, and continuation of utility services as required, together with details for dust and noise control.
- C. Provide detailed sequence of demolition and removal work to ensure uninterrupted progress of Owner's on-site operations.
- D. Conduct selective demolition work in manner to minimize disruption of Owner's normal operations.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Designated materials and equipment for re-installation: Carefully remove, store, and protect.
- B. Owner's Salvage: Clean, store, and transfer designated materials and equipment to Owner, and obtain receipt.
- C. Contractor's Salvage:
  - 1. Contractor shall verify with and obtain approval from Owner for all Contractor salvage items prior to their removal from site.
  - 2. Transport salvaged items from site as items are removed.
  - 3. Storage or sale of removed items on site not permitted.
- D. Coordinate with the Owner on disposition of salvage items not scheduled for reuse, demolished materials, and equipment. Deliver salvaged materials, not reused, as directed, by or to the Owner.

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

- A. Examine surfaces and adjacent areas of Work under this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.
- B. Starting Work constitutes acceptance of existing conditions.

**3.2 PREPARATION**

- A. Ensure safe passage of persons around area of demolition.
- B. Protect existing finish work to remain in place.
- C. Protect floors with suitable coverage.
- D. Construct temporary insulated solid dustproof partitions where noise or extensive dirt or dust operations are performed. Equip partitions with dustproof doors and security locks if required.
- E. Provide temporary weather protection between demolition and removal of existing construction on exterior surfaces and installation of new construction to ensure no water leakage or damage occurs to structure or interior areas of existing building.
- F. Cease operations and notify Owner immediately if safety of structure appears to be endangered.
- G. Take precautions to support structure until determination is made for continuing operations.
- H. Cover and protect furniture, equipment, and fixtures to remain from soiling or damage when demolition work is performed in rooms or areas from which such items have not been removed.
- I. Subsurface Utilities:
  - 1. Identify the location and depth of connection points of subsurface utilities prior to purchasing materials or beginning Work connecting to existing utilities.
  - 2. If the utility connection points differ in any material way from the Drawings submit an online Lucernex Request for Information (RFI) immediately.
    - a. Failure to provide this notice may result in Owner's rejection of subsequent change order for additional Work.
- J. Surveying:
  - 1. Contractor shall coordinate the setting of building corners with the Owner's surveyor.
  - 2. Complete the footing/stem wall survey prior to pouring the foundation.
  - 3. The survey must include horizontal dimensions from a minimum of two property lines and top of footing elevations relative to finished floor elevations.

**3.3 DEMOLITION**

- A. Demolition work within existing building shall be scheduled during 11:00 PM to 6:00 AM.
  - 1. Submit written request for approval to the Owner 14 calendar days in advance of the date Contractor demolition work is required to begin in the existing building.
- B. The Owner will remove or, under separate contract, have materials and equipment which the Owner requires removed, prior to commencement of Work under this Section. Coordinate scheduling of removal of Owner materials and equipment with Owner and Store Manager.
- C. Demolition:

1. Perform demolition work in systematic manner.
2. Demolish concrete and masonry in small sections.
3. Cut concrete and masonry at junctures with construction to remain, using masonry saws or hand tools, and make cuts straight and square with building.
4. Do not use powder-driven impact tools.
5. Locate demolition equipment throughout structure and promptly remove debris to avoid imposing excessive loads on supporting walls, floor, or framing.
6. For interior slabs on grade, use removal methods that will not crack or structurally disturb adjacent slabs or partitions.
7. Perform cutting of existing concrete and masonry construction with saws and core drills. Do not use jack-hammers or explosives.
8. Patch with seams which are durable and as invisible as possible. Comply with specified tolerances for the work.
9. Where selective demolition terminates at a "surface" or construction "to remain," completely remove all traces of material selectively demolished, including mortar beds. Provide smooth, even substrate transition.
10. Demolition shall be carried out in a safe manner and in strict accordance with OSHA regulations.
11. The Contractor shall field verify the extent of demolition. The Work includes, but is not limited to, the demolition and removal of walls, doors, fixtures, plumbing, mechanical and electrical items including conduits and ductwork as shown on Drawing or as required for the installation of the new Work for a complete job.
12. When utilities are removed, cap and seal a minimum of 8" below finish floor or a minimum of 6" above finish ceiling.
13. When removing existing structural items, provide adequate shoring, bracing and support systems to keep the existing structure intact and in a safe condition.

D. Environmental Controls:

1. Use water sprinkling, temporary enclosures, and other suitable methods to limit dust and dirt rising and scattering in air to lowest practical level.
2. Comply with governing regulations pertaining to environmental protection.
3. Do not use water when it may create hazardous or objectionable conditions, such as ice, flooding, or pollution.

E. Below Grade Demolition:

1. Demolish and remove below grade wood or metal construction.
2. Break up below grade concrete slabs.

F. Filling Below-Grade Voids:

1. Fill below grade areas and voids resulting from demolition work.
2. Use fill consisting of earth, gravel, or sand, free of trash and debris, stones over 6 inches diameter, roots, or other organic matter.

G. Site Grading:

1. Perform in accordance with Drawings and specifications and recommendations of the Geotechnical Report.
2. Remove and replace unsuitable materials specified in the Geotechnical Report.
3. Compact excavated or filled areas as outlined in the Geotechnical Report.
  - a. Provide moisture control and content as required by Owner's Laboratory Testing Services.

- H. If unanticipated mechanical, electrical, or structural elements conflicting with intended function or design are encountered, submit written report of nature and extent of conflict to Architect and Owner. Rearrange demolition schedule to continue job progress without delay.

### 3.4 DISPOSAL OF DEMOLISHED MATERIALS

- A. Dispose of non-hazardous demolished materials as specified in Conformance Specification Section 017419.

- B. Deposit waste materials, rubbish, and debris in waste containers.
- C. Do not allow waste materials, rubbish, and debris to accumulate and become an unsightly or hazardous condition.
- D. If hazardous materials are encountered during demolition operations, comply with applicable regulations, laws, and ordinances concerning removal, handling, and protection against exposure or environmental pollution. Notify Owner, in writing, of hazardous materials encountered.

### 3.5 POLLUTION CONTROLS

- A. Use temporary enclosures and other suitable methods to limit the amount of dust and dirt rising and scattering in the air to the lowest practical level.
- B. Comply with governing authorities pertaining to environmental protection.
- C. Clean adjacent portion of the structure and improvement of dust, dirt and debris caused by demolition operations, as directed by the Owner and governing authorities. Return adjacent areas to conditions existing prior to the start of the work.
- D. Burning of trash, debris, or removed materials not permitted on site.

### 3.6 SCHEDULE OF SELECTIVE DEMOLITION

- A. Remove and dispose of existing building items and adjacent sitework items as required for Work and as indicated on Drawings.
- B. Interior or Exterior Slab on Grade:
  - 1. Locate portion of existing concrete slab to be removed. Saw cut perimeter of existing slab minimum of 50% of slab thickness to provide a breaking point to remove existing concrete.
  - 2. Wet saw concrete slabs along straight lines to a minimum depth of 2 inches where concrete is to be removed. The method of removal shall maintain the undamaged slab edge within the sawed line. Jack hammers may be used only "after hours" and with permission from the Owner. Jack hammers may not be used to remove/cut concrete from the existing slab, but only to break up concrete which has already been saw cut from the concrete slab.
  - 3. Break concrete slab to be removed into portions easily removed, maximum 3 feet dimension at any side.
  - 4. Remove concrete pieces within removed area down to the existing subgrade.
- C. Exterior Masonry:
  - 1. Locate portion of existing masonry wall to be removed. Units which are removed: "tooth" from existing construction.
  - 2. Verify that temporary supports, enclosures, and bracing are in place and adequate for intended purpose.
  - 3. Remove only that portion of the exterior wall which is required for the indicated new construction.
- D. Below Grade Construction:
  - 1. Remove below grade construction including foundation work, column footings, and abandon mechanical, plumbing, and electrical work as indicated.
- E. Interior Walls and Partitions:
  - 1. Remove interior walls and partitions as indicated.
  - 2. Remove all top and bottom framing tracks and overhead braces of partitions being removed.
- F. Doors and Frames:
  - 1. Remove hollow metal doors and frames.
  - 2. Remove aluminum storefront doors and frames.

### SELECTIVE SITE DEMOLITION

3. Remove aluminum automatic doors and frames.

G. Interior Finishes:

1. Remove carpet and carpet adhesives.
2. Removal of vinyl composition tile flooring (VCT) and acoustical ceiling tile (ACT).

H. Mechanical System:

1. Remove mechanical equipment and related ductwork as indicated.
2. Provide temporary weathertight protection of openings in roof and exterior walls.
3. Remove accessories to the mechanical system including, but not limited to, hanger straps.

I. Plumbing:

1. Remove plumbing fixtures and accessories including exposed supply, waste, and vent piping as indicated.
2. Identify concealed piping within and below slab construction, and cap a minimum of 3 inches below finish floor unless otherwise noted.
3. Cap or plug ends of below grade abandoned sewer and drain pipe and vents. Abandoned branch drains connected to a live line shall be capped within two feet of connection to the live line.

J. Electrical Service:

1. Remove abandoned electrical fixtures, conduit, boxes, and wiring as indicated.
2. Remove electrical circuits including conduct as indicated.

### 3.7 OWNER TESTING AND INSPECTION

- A. The Owner will perform testing and inspection (T&I) but only as a means to satisfy the Owner of contract compliance and as assurance to the Owner of Contractor quality control performance.
- B. Failure to detect defective material or Work will neither prevent rejection when defects are discovered later nor will it obligate Owner to make final acceptance.
- C. Laboratory Testing Requirements:
  1. Verify that filled areas and sub-grade areas within the building pad area, utility excavation / backfill, and pavement areas are compacted in accordance with the Drawings and specifications.
- D. Contractor Responsibilities:
  1. The Contractor is responsible for any remedial actions, retesting and/or engineered corrective action required to resolve non-conforming tests and/or observations.

END OF SECTION 024113

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 024113 – SELECTIVE SITE DEMOLITION

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the selective site demolition is in general conformance with the Contract Documents and applicable Codes. The selective site demolition has been provided in accordance with the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

SELECTIVE SITE DEMOLITION CONTRACTOR:

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

\_\_\_\_\_  
(Subcontractor name and address) Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address) Phone Number: (    ) \_\_\_\_\_

## SECTION 033000 - CAST-IN-PLACE CONCRETE

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
  - 1. Footings.
  - 2. Foundation walls.
  - 3. Slabs-on-grade.
- B. Related Sections:
  - 1. Section 013300 – "Submittal Procedures"
  - 2. Section 014000 – "Quality Requirements"
  - 3. Section 033500 – "Concrete Finishing"

## 1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement; subject to compliance with requirements.

## 1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture, submitted on the forms found at the end of this section. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
- C. Indicate the following for each mix design submittal:
  - 1. Building element designation.
  - 2. Proportions of cement, fine and coarse aggregates, and water.
  - 3. Water-cement ratio, design strength, slump and air content.
  - 4. Type of cement and aggregates.
  - 5. Type and dosage of admixtures.
  - 6. Documentation of average strength for each type of concrete.
- D. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

- E. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
  - 1. Location of construction joints is subject to approval of the Architect.
- F. Qualification Data: For Installer.
- G. Material Certificates: For each of the following, signed by manufacturers:
  - 1. Cementitious materials.
  - 2. Admixtures.
  - 3. Steel reinforcement and accessories.
  - 4. Waterstops.
  - 5. Curing compounds.
  - 6. Floor and slab treatments.
  - 7. Bonding agents.
  - 8. Adhesives.
  - 9. Vapor retarders.
  - 10. Semirigid joint filler.
  - 11. Joint-filler strips.
  - 12. Repair materials.
- H. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
  - 1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.
- I. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.

## 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
- C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
  - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
  - 2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.
- D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.



- E. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
  - 1. ACI 301, "Specifications for Structural Concrete,"
  - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
  - 3. ACI 305.1, "Specifications for Hot Weather Concreting".
  - 4. ACI 306.1, "Specifications for Cold Weather Concreting".
  - 5. ACI 318, "Building Code Requirements for Reinforced Concrete and Commentary".
  - 6. ACI SP66, "ACI Detailing Manual".
  - 7. ACI 302.1R, "Guide for Concrete Floor and Slab Construction".
- F. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.
- G. Preinstallation Conference: Conduct conference at Project site.
  - 1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
    - a. Contractor's superintendent.
    - b. Independent testing agency responsible for concrete design mixtures.
    - c. Ready-mix concrete manufacturer.
    - d. Concrete subcontractor.
    - e. Special concrete finish subcontractor.
  - 2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semirigid joint fillers, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Transporting: Ready-mixed concrete supplier shall have sufficient capacity and adequate facilities to provide continuous delivery at the rate required for continuous placement throughout any sequence of placement.
- B. Storage of Concrete Materials:
  - 1. Store cement in weather tight buildings or bins which prevent intrusion of moisture or contaminants. Store different types of cement in separate facilities.
  - 2. Stockpile aggregates to prevent segregation and contamination with other materials. Thaw frozen aggregates before use.
  - 3. Sand shall be drained to a uniform moisture content before use.
  - 4. Store admixtures securely to prevent contamination, evaporation damage or temperature variation in excesses of the range recommended by the manufacturer.
- C. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.
- D. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

## PART 2 - PRODUCTS

## 2.1 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Plain-Steel Wire: ASTM A 1064, as drawn.
- C. Plain-Steel Welded Wire Reinforcement: ASTM A 1064, plain, fabricated from as-drawn steel wire into flat sheets.
- D. Deformed-Steel Welded Wire Reinforcement: ASTM A 1064, flat sheet.

## 2.2 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
  - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

## 2.3 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
  - 1. Portland Cement: ASTM C 150, Type I or II. Cement shall be supplied from a single manufacturer. Supplement with the following:
    - a. Fly Ash: ASTM C 618, Class C or F. Use only one type and source throughout project.
    - b. Ground Granulated Blast Furnace Slag: ASTM C 989, Grade 100 or 120. Use only one type and source throughout project.
    - c. Silica Fume: ASTM C 1240, amorphous silica. Use only one source throughout project.
  - 2. Blended Hydraulic Cement: ASTM C 595, Type IP, portland-pozzolan, or Type I (PM), pozzolan-modified portland cement.
- B. Normal-Weight Aggregates: ASTM C 33 coarse aggregate or better, graded. Provide aggregates from a single source.
  - 1. Maximum Coarse-Aggregate Size: As noted in "Concrete Mixtures for Building Elements." Coarse aggregate shall conform to applicable requirements of ASTM C 33 gravel or crushed stone, suitably processed, washed and screened, consisting of hard, durable particles without adherent coatings.
  - 2. Fine Aggregate: conform to applicable requirements of ASTM C 33, natural bank or river sand, washed and screened, consisting of hard, durable, uncoated particles free of deleterious matter, free of materials with deleterious reactivity to alkali in cement, and graded from coarse to fine to produce a minimum percentage of voids.

- C. Water: ASTM C 94 and potable.

## 2.4 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
  - 1. Water-Reducing Admixture: ASTM C 494, Type A.
  - 2. Retarding Admixture: ASTM C 494, Type B.
  - 3. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
  - 4. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
  - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494, Type G.
  - 6. Plasticizing and Retarding Admixture: ASTM C 1017, Type II.

## 2.5 WATERSTOPS

- A. Preformed Plastic Adhesive Waterstops: Provide preformed, non-expansive, self-sealing, plastic adhesive waterstop. Representative product:
  - 1. Synko-Flex SF302 – Waterstop.

## 2.6 VAPOR RETARDERS

- A. Plastic Vapor Retarder: ASTM E 1745, Class A, single or multi-layer, not less than 15 mils thick:
  - 1. Maximum perm rating of 0.01 perms (U.S.) per ASTM E 96 or F 1249.
  - 2. Puncture resistance of 2200g or greater per ASTM D 1709, B.
  - 3. Include manufacturer's recommended adhesive or pressure-sensitive joint tape, and include manufacturer's proprietary penetration flashing for all through-slab penetrations.
  - 4. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Vapor Block 15; Raven Industries Inc.
    - b. Stego Wrap, 15 mil; Stego Industries, LLC.
    - c. Moistop Ultra 15; Fortifiber Corporation.

## 2.7 CURING MATERIALS

- A. Sealer: Non-Pigmented Sealer for Horizontal and Vertical Surfaces
  - 1. Products: Shall comply with Federal, State, and Local volatile organic compounds (VOC) regulations, limited to the following (no substitutions):
    - a. Cure\Seal\Hardener: Ashford Formula by Curecrete Distribution, Inc. Ashford Formula
- B. Dissipating Curing Compound: ASTM C 309, Type 1, Class A or B
  - 1. Products: Shall comply with Federal, State, and Local volatile organic compounds (VOC) regulations, limited to the following (no substitutions):
    - a. Day-Chem REZ Cure (J-11-W), by Dayton Superior
    - b. Kurez DR VOX, by Euclid Chemical Company
    - c. SC Cure 500, by SpecChem

- C. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- D. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- E. Water: Potable.

## 2.8 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.
- B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 per ASTM D 2240.
- C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
  - 1. Types I and II, non-load bearing for bonding hardened or freshly mixed concrete to hardened concrete.
- E. Non-Shrink Grout: Pre-mixed, non-shrinking, minimum compressive strength of 5000 psi in 28 days, conforming to U.S. Army Corps of Engineers specifications No. CRD-C621. Grout exposed to view shall be non-oxidizing.

## 2.9 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
  - 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
  - 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
  - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
  - 4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109.
- B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.
  - 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
  - 2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
  - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
  - 4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109.

## 2.10 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixtures, strength test records, or field test data, according to ACI 301.
  - 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
  - 2. Required Average Strength for each type of concrete:
    - a. Where suitable test records for the concrete production facility are available, design strength may be tested on the standard deviation in accordance with ACI 318.
    - b. Where strength test records are not available, design strength and documentation of average strength as noted in ACI 318, Chapter 5.
- B. Cementitious Materials:
  - 1. Minimum cement content:
    - a. Cementitious Materials content shall not be less than that noted in "Concrete Mixtures for Building Elements," unless noted otherwise in Contract Documents.
  - 2. Fly ash, GGBFS, or silica fume may be used to reduce the total amount of portland cement, which would otherwise be used. If used, limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
    - a. Fly ash: 25 percent maximum.
    - b. GGBSF: 50 percent maximum.
    - c. Combined fly ash and silica fume: 25 percent maximum.
    - d. Combined GGBFS and silica fume: 50 percent maximum.
    - e. Do not combine fly ash and GGBFS in the same concrete mixture.
    - f. Fly ash, GGBFS, silica fume and/or other pozzolans shall not be used in interior slab concrete.
- C. Admixtures: Use admixtures according to manufacturer's written instructions.
  - 1. Use water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
  - 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
  - 3. Use water-reducing or plasticizing admixture in pumped concrete, and concrete with a water-cementitious materials ratio below 0.50.
  - 4. Slump limits noted in the following building elements are values before adding water-reducing admixtures. Slump limits shall be no more than 8" after adding the water-reducing admixture.
- D. For concrete exposed to freeze thaw, air content shall be as indicated in Table 2.1 - Air Content for Exterior Concrete, plus or minus 1.5 percent, unless noted otherwise in Contract Documents. For concrete not exposed to freeze thaw, do not add air-entraining agents.

## 2.11 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Footings and Piers: Proportion normal-weight concrete mixture as follows:
  - 1. Minimum Compressive Strength: 3000 psi at 28 days, unless noted otherwise on the structural drawings.
  - 2. Maximum Water-Cementitious Materials Ratio: 0.58.
  - 3. Slump Limit: 5 inches plus or minus 1 inch, measured at point of placement.
  - 4. Maximum Coarse Aggregate Size: Not larger than 1 1/2 inch.
  - 5. Minimum Cementitious Materials Content: 470 pounds per cubic yard.
  - 6. Air Content: not required.

- B. Exterior Structural Concrete, Foundation Walls, Grade Beams, and Pedestals: Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: 4500 psi at 28 days, unless noted otherwise on the structural drawings.
  2. Maximum Water-Cementitious Material Ratio: 0.45, unless noted otherwise on the structural drawings.
  3. Slump Limit: 4 inches plus or minus 1 inch
  4. Maximum Coarse Aggregate Size: Not larger than 1 1/2 inch.
  5. Minimum Cementitious Materials Content: 470 pounds per cubic yard.
  6. Air Content: Per Table 2.1.
- C. Interior Slabs-on-Grade: Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: 4000 psi at 28 days.
  2. Maximum Water-Cementitious Material Ratio: 0.53.
  3. Slump Limit: 5 inches plus or minus 1 inch, measured at point of placement.
  4. Aggregates:
    - a. Coarse Aggregate: Maximum Aggregate Size: 1 inch
    - b. Fine Aggregate: If manufactured sand is used, it shall consist of no more than 75% of the total sand blend.
    - c. Aggregates shall be proportioned to meet the following requirements:
      - 1) Coarseness Factor shall be 60% to 75%. Coarseness Factor, C.F., is defined as  $C.F. = \text{Aggregate retained on } 3/8" \text{ sieve} / \text{Aggregate retained on } \#8 \text{ sieve}$ .
      - 2) Adjusted Workability Factor shall satisfy:  $[(11.25 - 0.15C.F.) + 36] \pm 2.5$ . Adjusted Workability Factor, Adj.-W.F., is defined as  $\text{Adj.-W.F.} = \text{Combined aggregate \% passing } \#8 \text{ sieve} + [(\text{cement} - 564) / 37.6]$
      - 3) Combined aggregate passing any sieve size shall not exceed 24%.
  5. Minimum Cementitious Materials Content: 560 pounds of Portland Cement per cubic yard. Fly ash, GGBFS, silica fume, and other pozzolans are not permitted in interior slab concrete.
  6. Do not air entrain interior slab concrete.
- D. Exterior Concrete Slabs (other than Sidewalks): Proportion normal weight concrete mixture as follows:
1. Minimum Compressive Strength: 4500 psi at 28 days, unless noted otherwise on the structural drawings.
  2. Maximum Water-Cementitious Material Ratio: 0.45, unless noted otherwise on the structural drawings.
  3. Slump Limit: 5 inches plus or minus 1 inch, measured at point of placement.
  4. Maximum Coarse Aggregate Size: 1 inch.
  5. Minimum Cementitious Materials Content: 470 pounds per cubic yard.
  6. Air Content: Per Table 2.1.
- E. Sidewalks: Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: 3500 psi at 28 days.
  2. Maximum Water-Cementitious Material Ratio: 0.58.
  3. Slump Limit: 5 inches plus or minus 1 inch, measured at point of placement.
  4. Maximum Coarse Aggregate Size: 1 inch.
  5. Minimum Cementitious Materials Content: 470 pounds per cubic yard.
  6. Air Content: Per Table 2.1.

Table 2.1 - Air Content for Exterior Concrete

Nominal Maximum Aggregate Size (in)	Minimum Air Content (Percent)
3/8	7.5
1/2	7
3/4	6

1	6
1 1/2	5.5
Construction tolerance for air content is +/- 1.5 percent.	

## 2.12 FABRICATING REINFORCEMENT

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

## 2.13 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94, and furnish batch ticket information.
  - 1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

## PART 3 - EXECUTION

### 3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. At Architectural Appearance Quality Smooth-Formed Finished Concrete Walls coordinate snap-tie hole layout and spacing with Architect.
- D. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
  - 1. Class A, 1/8 inch for smooth-formed finished surfaces.
  - 2. Class C, 1/2 inch for rough-formed finished surfaces.
- E. Construct forms tight enough to prevent loss of concrete mortar.
- F. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
  - 1. Install keyways, reglets, recesses, and the like, for easy removal.
  - 2. Do not use rust-stained steel form-facing material.
- G. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- H. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

## CAST-IN-PLACE CONCRETE

- I. Install void forms in accordance with manufacturer's written recommendations. Protect forms from moisture and crushing.
- J. Chamfer exterior corners and edges of permanently exposed concrete.
- K. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- L. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- M. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- N. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

### 3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."

### 3.3 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.
  - 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 75 percent of its 28-day design compressive strength.
  - 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

### 3.4 SHORES AND RESHORES

- A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring. Reference submittal portion of this specification section.



1. Support of forms: Provide adequate shoring under forms to support loads imposed by wet concrete, equipment and workmen. Shores shall be sufficiently strong and closely spaced to prevent excessive deflections or distortions during placement of concrete.
  2. Do not remove shoring or reshoring until measurement of slab tolerances is approved.
- B. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

### 3.5 VAPOR RETARDERS

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions. Reference Contract Drawings for locations requiring vapor retarder placement.
1. Lap vapor retarder over footings and seal to foundation walls.
  2. Lap joints 6 inches and seal with manufacturer's recommended tape.
  3. Seal penetrations (including pipes) per manufacturer's instructions.
  4. Repair damaged areas by cutting patches of vapor retarder, overlapping damaged area 6 inches and taping all four sides with manufacturer's recommended tape.
- B. Place vapor retarder on top of the drainage course material and directly below slab at all interior slabs.

### 3.6 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
1. Weld reinforcing bars according to AWS D1.4, where indicated on Contract Drawings.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

### 3.7 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Contraction (Control) Joints in Slabs-on-Grade: Within 12 hours of pouring slabs, form weakened-plane contraction joints, sectioning concrete into areas as indicated on the Contract Drawings. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

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1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
    - a. Primary Method: Soft-Cut System method, by Soff-Cut International, Corona, CA (800) 776-3328. Finisher must have documented successful experience in the use of this method prior to this project. Install cuts within 2 hours after final finish at each saw cut location. Use 1/4 inch thick blade, cutting 1-1/4 inch into slab.
    - b. Optional Method (Where Soft-Cut System Method Equipment is Not Available): Properly time cutting with the set of the concrete. Saw-Cut control joints within 12 hours after finishing. Start cutting as soon as the concrete has hardened sufficiently to prevent aggregates being dislodged by the saw. Complete cutting before shrinkage stresses become sufficient to produce cracking. Use 1/4 inch thick blade, cutting 1-1/4 inch into slab.
  2. Spacing: Provide joints at locations as noted on Contract Drawings.
    - a. Placement of saw joints must be coordinated with the tile joints and this requirement governs over locations shown on the Contract Drawings.
- C. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated on Contract Drawings.
1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated on Contract Drawings.
  2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.
  3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- D. Doweled Joints: Install dowel bars and support assemblies at joints as noted on the Contract Drawings. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint. In lieu of dowels, plate dowel system approved by the Engineer of Record may be used at Contractor's option.

### 3.8 WATERSTOPS

- A. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated on Contract Drawings, according to manufacturer's written instructions, adhesive bonding or mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.
- B. Preformed Plastic Adhesive Waterstops: Install in construction joints and at other locations indicated on Contract Drawings, according to manufacturer's written instruction, bonding or mechanically fastening and firmly pressing into place. Install in longest lengths practicable.

### 3.9 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Precautions to protect fresh concrete from developing plastic shrinkage cracks must be taken in advance of concrete placement when evaporation rate due to any combination of temperature, humidity, and wind velocity is expected to approach 0.2 lb./sq. ft./hr. as determined by ACI

## CAST-IN-PLACE CONCRETE

305R. Acceptable precautions to reduce the rate of evaporation include use of wind breaks, fog spray, covering with polyethylene sheeting, or wet cover.

- C. Do not add water to concrete during delivery, at Project site, or during placement unless approved by the Structural Engineer-of-Record.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
  - 1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
  - 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
  - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- E. Deposit and consolidate concrete for slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
  - 1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
  - 2. Maintain reinforcement in position on chairs during concrete placement. Do not drive equipment over placed reinforcing.
  - 3. Screed slab surfaces with a straightedge and strike off to correct elevations. All interior slabs shall be screeded with boom-type, vibrating laser-guided screed only.
    - a. Check screed head for straightness with feeler gauges prior to start and at least once during each pour. Replace worn or damaged heads.
  - 4. Slope surfaces uniformly to drains where required.
  - 5. Lack of Slope: Confirm with Architect before proceeding when Contract Drawings show exterior flatwork without a specific slope.
  - 6. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- F. Cold-Weather Placement: Comply with ACI 306.1, ACI 306R and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
  - 1. When the average of the highest and lowest ambient temperature from midnight to midnight is expected to be less than 40 degrees F for more than three successive days, deliver concrete to meet the following minimum temperatures immediately after placement:
    - a. 55 degrees F for sections less than 12 inches in the least dimension;
    - b. 50 degrees F for sections 12 to 36 inches in the least dimension;
    - c. 45 degrees F for sections 36 to 72 inches in the least dimension; and
    - d. 40 degrees F for sections greater than 72 inches in the least dimension.
  - 2. The temperature of concrete as placed shall not exceed these values by more than 20 degrees F.
  - 3. The minimum requirements may be terminated when temperatures above 50 degrees F occur during more than half of any 24 hour duration.
  - 4. When the outdoor temperature is less than 40 degrees F, maintain temperature of placed concrete at not less than 50 degrees F for required curing time.
  - 5. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

#### CAST-IN-PLACE CONCRETE

6. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- G. Hot-Weather Placement: Comply with ACI 301, ACI 305.1, ACI 305R, and as follows:
  1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
  2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.
  3. Precautions to protect fresh concrete from developing plastic shrinkage cracks must be taken in advance of concrete placement when evaporation rate due to any combination of temperature, humidity, and wind velocity is expected to approach 0.2 lb./sq. ft./hr. as determined by ACI 305R. Acceptable precautions to reduce the rate of evaporation include use of wind breaks, fog spray, covering with polyethylene sheeting, or wet cover.
- H. Windy Weather Placement: Comply with ACI 301, ACI 305.1, ACI 305R and as follows:
  1. Precautions to protect fresh concrete from developing plastic shrinkage cracks must be taken in advance of concrete placement when evaporation rate due to any combination of temperature, humidity, and wind velocity is expected to approach 0.2 lb./sq. ft./hr. as determined by ACI 305R. Acceptable precautions to reduce the rate of evaporation include use of wind breaks, fog spray, covering with polyethylene sheeting, or wet cover.

### 3.10 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities. Fill holes and honeycombs.
  1. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
  1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, to be covered with a coating or covering material applied directly to concrete.
- C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated on Contract Documents:
  1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
  2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent

formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated on the Contract Drawings.

### 3.11 FINISHING SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraighening, and finishing operations for concrete surfaces, unless noted otherwise in the Contract Documents. Do not wet concrete surfaces.
- B. Initial Leveling:
  - 1. Initial floating, darbying, and straight-edging shall be completed prior to appearance of bleed water on slab surfaces.
  - 2. A channel float of 10 foot minimum width shall be used for initial and later leveling for interior concrete slabs.
  - 3. Flatness and levelness may not be achieved by grinding to the extent that aggregate is exposed or finish is compromised.
- C. Light Broom Finish: While still plastic, texture concrete surface that has been screeded and floated or darbied. Use soft-bristled brushes or brooms to produce a profile amplitude of 1/16 inch in one direction. Broom perpendicular to slope of slab or perpendicular to traffic for level slabs.
  - 1. Apply light broom finish to all exterior slabs unless indicated otherwise on the Contract Drawings.
- D. Floating in preparation for Trowel Finish and Hard Trowel Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture.
  - 1. Apply float finish to surfaces of all interior slabs.
  - 2. Begin floating after bleeding is complete and water, including sheen, is gone from the concrete surface.
  - 3. Interior slabs shall be floated with 3 passes minimum. Float second pass at 90 degrees to the direction of the first pass and float the third pass at 45 degrees to the previous pass.
- E. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
  - 1. Apply a Trowel Finish to surfaces of all floor slabs except as below or unless noted otherwise on Contract Drawings.
  - 2. Final slab shall meet the following:
    - a. Flatness: Overall Floor Flatness Rating of at least 50.
    - b. Levelness: Overall Floor Levelness Rating of at least 33.
- F. Hard Trowel Finish for Polished Concrete Floors: After applying float finish, apply first troweling and consolidate concrete by power-driven trowel. Continue power troweling passes at a 90 degree angle to previous pass and restraighten until surface is free of trowel marks and uniform in texture and appearance and an ACI 302 Type 5 surface is achieved.
  - 1. Final slab shall meet the following:
    - a. Flatness: Overall Floor Flatness Rating of at least 50.
    - b. Levelness: Overall Floor Levelness Rating of at least 33.
    - c. Appearance: Concrete Polishing Association of America (CPAA) Class A.

2. Apply a Hard Trowel Finish to all floor slabs to receive a polished concrete surface as noted in the Contract Drawings.

- G. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains at 1:100 nominal.

### 3.12 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Contract Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.
- D. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing. Curing shall be continued for a period of 7 days for Type I cement, or 3 days for Type III cement, or until tests indicate that the concrete has attained 75 percent of required strength.
- E. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h as determined by ACI 305R 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.
- F. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- G. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- H. Cure concrete, except interior floor slabs, according to ACI 308.1, and 308R by one or a combination of the following methods:
  1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
    - a. Water – Ponding or continuous sprinkling.
    - b. Continuous water-fog spray.
    - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
    - d. Application of sand kept continuously wet.
  2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven

- days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
- a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
  - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
  - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.
3. Penetrating Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process per manufacturer's instructions for multi-coat application. Maintain continuity of coating and repair damage during curing period. Comply with the following project conditions:
- a. Do not apply sealer to surfaces below 50 degrees F or above 95 degrees F unless recommended by manufacturer.
  - b. Do not apply sealer when rain is predicted within 24 hours after surface has been wet.
  - c. Do not use penetrating sealing compound to cure slabs to receive a polished surface.
- I. Cure interior slab concrete to receive a polished surface according to ACI 308.1, and 308R by the following method:
1. Dissipating Curing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by according to manufacturer's written instructions.
    - a. Application rate: As indicated by manufacturer for smooth, hard-trowelled floors, avoid over-application.
    - b. Do not allow compound to puddle.
    - c. Do not cover with polyethylene sheet or other impervious covers.

### 3.13 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
  1. Defer joint filling until concrete has aged at least one month. Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

### 3.14 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Notify Architect and Engineer of Record if structural repairs are necessary. Perform structural repairs with prior approval of method and materials from Architect and Engineer of Record. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
  2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
  3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
  2. After concrete has cured at least 14 days, correct high areas by grinding.
  3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
  4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
  5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
  6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
  7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
  8. Repair shrinkage cracks by filling cracks with pressure epoxy grout. Perform repairs with prior approval of method and materials from Architect and Engineer of Record.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.



- F. Repair materials and installation not specified above may be used, subject to Architect's approval.

### 3.15 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections as noted below along with inspection schedule items included in the Contract Drawings. Testing agency shall prepare tests and inspection reports and submit to Owner and Owner's Consultants.
- B. Inspections:
  - 1. Steel reinforcement placement.
  - 2. Steel reinforcement welding.
  - 3. Headed bolts and studs.
  - 4. Anchor rods.
  - 5. Verification of use of required design mixture.
  - 6. Concrete placement, including conveying and depositing.
  - 7. Curing procedures and maintenance of curing temperature.
  - 8. Verification of concrete strength before removal of shores and forms from beams and slabs.
  - 9. All other special inspection items as noted on the Contract Drawings.
- C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
  - 1. Testing Frequency: Obtain at least one composite sample for each 150 cu. yd. or fraction thereof of each concrete mixture placed each day. For slabs, obtain at least one composite sample for the minimum of each 150 cu. yd. or each 5,000 square feet of slab placed each day. For shotcrete mixtures, obtain at least one composite sample for each 50 cu. yd. or fraction thereof placed each day.
    - a. One composite sample shall consist of a minimum of four cylinders.
    - b. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
  - 2. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
  - 3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
  - 4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
  - 5. Compression Test Specimens: ASTM C 31.
    - a. Cast and laboratory cure four standard cylinder specimens for each composite sample of 6x12" cylinder specimens or cast and laboratory cure five standard cylinder specimens for each composite sample of 4x8" cylinder specimens.
    - b. Cast and field cure four standard cylinder specimens for each composite sample of 6x12" cylinder specimens or cast and field cure five standard cylinder specimens for each composite sample of 4x8" cylinder specimens.
  - 6. Compressive-Strength Tests: ASTM C 39; test one laboratory-cured specimen at 7 days and either two 6x12" cylinder specimens or three 4x8" cylinder specimens at 28 days. The remaining laboratory-cured specimen shall be a hold cylinder to be broken at the discretion of the Engineer-of-Record.
    - a. Test two field-cured specimens at 7 days and either two 6x12" cylinder specimens or three 4x8" cylinder specimens at 28 days.

### CAST-IN-PLACE CONCRETE

- b. A compressive-strength test shall be the average compressive strength from two 6x12" cylinder specimens or three 4x8" cylinder specimens obtained from same composite sample and tested at age indicated.
- 7. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
- 8. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
- 9. Test results shall be reported in writing to Architect, Structural Engineer, Owner, Owner's consultant, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests. Inspection reports shall include items inspected, inspection locations and verification of compliance or deviations from the Contract Documents.
- 10. Concrete strength tests made and tested by testing laboratory shall be the sole criteria of concrete strength unless in-situ tests are made in accordance with Building Code by a qualified independent testing laboratory. Concrete for which strength tests do not meet criteria for acceptance shall be considered inadequate until proven otherwise.
- 11. In any case, where strength tests of concrete fail to meet criteria specified herein, Structural Engineer of Record shall be the sole judge of structural adequacy of concrete. In such case, burden of proof of structural adequacy shall be the responsibility of Contractor. Strength evaluation shall conform to requirements of ACI 318. If strength evaluation testing indicates, in opinion of Structural Engineer of Record, that structure is of inadequate strength; portions of structure in questions shall be repaired or removed and replaced as directed by the Structural Engineer of Record at no additional expense to Owner. If strength test falls below specified strength, but not so low as to cause concern for structural adequacy, Architect may request improved conditions curing or modifications of design mixes to improve strength.
- 12. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
- 13. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Architect.
- 14. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- 15. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

END OF SECTION 033000

**CONCRETE MIX DESIGN SUBMITTAL FORM**  
 (This page required for all mix designs)

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

Sheet 1

Supplier's Mix ID: \_\_\_\_\_

Contractor: \_\_\_\_\_

Intended Use: (check all that apply)

- ☐ Footings  
☐ Exterior structural concrete, foundation walls,  
 and pedestals  
☐ Interior slab  
☐ Exterior slab  
☐ Sidewalk  
☐ Other Use: \_\_\_\_\_

Supplier: \_\_\_\_\_

**CONCRETE INFORMATION**

Design Strength at 28 Days: \_\_\_\_\_ psi

Water/Cement Ratio: \_\_\_\_\_

Slump

Without WR Admixture: \_\_\_\_\_

With WR Admixture: \_\_\_\_\_

Total Air Content: \_\_\_\_\_ %

**MIX DESIGN**

Mix Proportions	Identification	Weight (Lbs)	Density (SSD)	Volume (Cu Ft)	% Aggregate Absorption
Cement					
SCM*					
Coarse Aggregate - 1					
Coarse Aggregate - 2					
Coarse Aggregate - 3					
Fine Aggregate - A					
Fine Aggregate - B					
Water					
Air Content					
	Totals				
* SCM - Supplementary Cementitious Material, flyash, slag, silica fume. Not permitted in interior slab concrete.					

Admixtures	ASTM Designation	Product, Brand	Dosage (oz/cy)	Or Dosage (oz/cwt)

CONCRETE MIX DESIGN SUBMITTAL FORM  
(This sheet required for interior slab concrete only)

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

Sheet 2

Supplier's Mix ID: \_\_\_\_\_

## GRADATION ANALYSIS

Sieve Size	Percent Passing Each Sieve					Combined Percent Passing	Combined Percent Retained	
	Agg 1	Agg 2	Agg 3	Agg A	Agg B		Cumulative	Individual
1-1/2"								
1"								
3/4"								
1/2"								
3/8"								
#4								
#8								
PART 4 - #16								
#30								
#50								
PART 5 - #100								
#200								
% of Vol								

Combined % cumulative retained on 3/8": \_\_\_\_\_ = R1

R1/R2 = Coarseness Factor (C.F.): \_\_\_\_\_

Combined % cumulative retained on #8: \_\_\_\_\_ = R2

Combined % passing #8: \_\_\_\_\_ = Workability Factor (W.F.)

W.F. \_\_\_\_\_ + [(Cement wt. \_\_\_\_\_ - 564) / 37.6] = Adjusted W.F. (Adj-W.F.): \_\_\_\_\_

[(11.25 - 0.15 x C.F. \_\_\_\_\_) + 36] +/- 2.5 = Allowable Adj- W.F.: High: \_\_\_\_\_ Low: \_\_\_\_\_

## CURING AND FINISHING

(For Showroom floor)

Curing Compound: \_\_\_\_\_

Joint Filler: \_\_\_\_\_

Densifier/Sealant: \_\_\_\_\_

## SECTION 033500 – CONCRETE FLOOR SLAB FINISHING

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section Includes:
  - 1. Single application hardener, densifier and sealer for new concrete floors.
  - 2. Single application hardener, densifier and sealer for existing concrete floors.
- B. Related Sections:
  - 1. Section 013300 – “Submittal Procedures”
  - 2. Section 014000 – “Quality Requirements”
  - 3. Section 033000 – “Cast-In-Place Concrete”

## 1.2 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.
- B. ASTM International (ASTM):
  - 1. ASTM C779 – Abrasion Resistance of Horizontal Concrete Surfaces.
  - 2. ASTM C805 – Rebound Number of Hardened Concrete.
  - 3. ASTM C1028 - Standard Test Method for Determining the Static Coefficient of Friction (SCOF) of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method.
- C. Concrete Polishing Association of America (CPAA):
  - 1. CPAA D101.0 -- Bonded Abrasive Polished Concrete

## 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Qualification Data: For Installer.

## 1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- B. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by manufacturer.
- C. Protect materials from dirt, corrosion, oil, grease and other contaminants.

## 1.5 QUALITY ASSURANCE

- A. Refer to Section 033000 for quality assurance requirements.

## PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

- A. Subject to compliance with project requirements, provide products by the following to the extent as specified hereinafter for the specific product:
  - 1. Curecrete Distribution, Inc., Springville, UT. (800) 988-5654 (801) 489-5663. FAX: (801) 489-3307.
  - 2. Dayton Superior Corporation, Miamisburgh, OH. (888) 977-9600 (877) 266-7732.
  - 3. Euclid Chemical Company, Cleveland, OH. (800) 321-7628 (216) 531-9222.
  - 4. SpecChem, LLC., Kansas City, MO. (816) 968-5600 FAX: (816) 561-4029.

## 2.2 PRODUCTS

- A. Pre-Densifier Floor Cleaner: As recommended by densifier manufacturer.
- B. Hardener/Densifier/Sealer: Water-based, chemically reactive penetrating sealer and hardener that seals by densifying concrete. Provide one of the following:
  - 1. Ashford Formula, by Curecrete Distribution.
  - 2. Euco Diamond Hard, by Euclid Chemical Company.
  - 3. RetroPlate 99, by Curecrete Distribution.
  - 4. SpecHard, by SpecChem.
  - 5. Sure Hard J17, by Dayton Superior Corporation.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. For new concrete, place and level slabs as specified in Section 033000 – “Cast-In-Place Concrete.” Do not level and flatten by gridding to the extent that aggregate is exposed.
- B. Clean surfaces thoroughly prior to installation using products and methods recommended by the manufacturer. Completely remove dissipating curing compounds.
- C. If construction equipment must be used for application, diaper all components that could drip oil, hydraulic fluid, or other liquids, prior to use on slab.
- D. Do not use frozen materials. Thaw and agitate prior to use.
- E. Coordinate with joint filling operations. Do not perform wet cleaning within 72 hrs prior to joint filling.

### 3.2 HARDENER/DENSIFIER/SEALER APPLICATION

- A. New Concrete Application:
  - 1. Apply hardener/densifier/sealer product to new concrete immediately after troweling, as soon as the slab is safe to walk on. With colored concrete, wait a minimum of 30 days before application.
  - 2. Spray product on at the following rates:
    - a. Surfaces to receive polishing:
      - 1) First Coat: 250 sq. ft. / gallon, maximum.
      - 2) Second Coat: 700 sq. ft. / gallon, maximum.
    - b. All other exposed surfaces: 200 sq. ft. / gallon.
  - 3. Keep surface with hardener/densifier/sealer for a minimum soak-in period of 30 minutes without allowing it to dry out or become slippery.
    - a. In hot weather, slipperiness may appear before the 30 minute time period has elapsed. If that occurs, apply additional product as needed to keep the entire surface in a non-slippery state for the first 15 minutes. For the remaining 15 minutes, mist the surface as needed with water to keep the material in a non-slippery state. Follow manufacturer's hot weather application procedures.

4. When the treated surface becomes slippery after the soak-in period, lightly mist with water until slipperiness disappears.
5. Wait for surface to become slippery again, then flush entire surface with water to remove product residue.
6. Squeegee surface completely dry. Flush remaining slippery areas until no residue remains.
7. Wet vacuum or use scrubbing machine in accordance with manufacturer's written instructions to remove remaining residue.

B. Existing Concrete Application:

1. Apply hardener/densifier/sealer only to clean, bare concrete.
2. Thoroughly remove previous treatments, laitance, oil, and other contaminants.
3. Saturate surface with product, re-spray or broom excess onto dry spots.
4. Keep surface wet with product for a minimum soak in period of 30-40 minutes.
5. If most of the material has been absorbed after the 30-minute soak-in period, remove all excess material, especially from low spots, using broom or squeegee.
6. If most of the material remains on the surface after the 30-minute soak-in period, wait until the surface becomes slippery and then flush with water, removing all product residue. Squeegee completely dry. Flush any remaining slippery areas until no residue remains.
7. If water is not available, remove residue using squeegee.

3.3 DISPOSAL

- A. Upon completion of hardener/densifier/sealer application, dispose of excess material as required by local agency having jurisdiction.
- B. Certified applicator shall remove all product containers from job site immediately upon completion of work.

3.4 POLISHING

- A. Refer to Architectural drawings for floor areas to receive polished surface.
- B. Polishing Procedure:
  1. Allow first coat of densifier/sealer to fully cure.
  2. Polishing procedures may not commence until slab has cured a minimum of 28 days.
  3. Floors indicated to receive polished surface shall be polished to within 1/8" of all walls, partitions and permanent equipment already installed at the time of polishing. Use handheld polishers/burnishers as required.
  4. Polish floors with progressively finer grit diamond impregnated pads to CPAA D101.0 Floor Gloss Level 2, Satin using the following 4 step procedure:
    - a. Step 1 – Grind/polish with 50 grit diamond impregnated pads. Broom and vacuum floor to remove dust.
    - b. Step 2 – Grind/polish with 100 grit diamond impregnated pads. Broom and vacuum floor to remove dust.
    - c. Step 3 – Grind/polish with 200 grit diamond impregnated pads. Broom and vacuum floor to remove dust.
    - d. Step 4 – Grind/polish with 400 grit diamond impregnated pads. Broom and vacuum floor to remove dust.
  5. Apply second coat of densifier/sealer as directed above and allow to cure.
  6. Polish floors with progressively finer grit diamond impregnated pads to CPAA D101.0 Floor Gloss Level 3, Semi-Polished, using the following 4 step procedure:
    - a. Step 1 – Grind/polish with 100 grit diamond impregnated pads. Broom and vacuum floor to remove dust.

- b. Step 2 – Grind/polish with 200 grit diamond impregnated pads. Broom and vacuum floor to remove dust.
  - c. Step 3 – Grind/polish with 400 grit diamond impregnated pads. Broom and vacuum floor to remove dust.
  - d. Step 4 – Grind/polish with 800 grit diamond impregnated pads. Broom and vacuum floor to remove dust.
- C. Final floor finish requirements:
  - 1. CPAA Class A, Cream, Level 3, Semi-Polished appearance
  - 2. Measured Gloss Value: 30 minimum as measured per ASTM D 1455 using a Horiba IG-320 Gloss Checker at owner possession.
  - 3. Finish shall have an even finish with no evidence of streaking, scratching, or residue, nor have a hazy appearance at the time of owner possession.

### 3.5 FLOOR PROTECTION

- A. Protect installed floors for a minimum of three (3) months, until chemical reaction process is complete. Polished floors shall be protected from damage until the owner takes possession of the building.
- B. Do not allow traffic on floors for three (3) hours after application.
- C. Do not allow vehicles on concrete slab.
- D. Do not allow pipe cutting using pipe cutting machiner on concrete slab.
- E. Do not allow temporary placement and storage of steel members on concrete slabs.
- F. Clean spills immediately and spot-treat stains with degreaser or oil emulsifier.

### 3.6 MAINTENANCE

- A. Clean floor regularly in accordance with manufacturer's recommendations.

END OF SECTION 033500



CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 033500 – CONCRETE FLOOR SLAB FINISHING

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

## Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the concrete finishing is installed and is in general conformance with the Contract Documents, applicable Codes, and shop drawings. The concrete finishing has been provided in accordance with the manufacturer's published instructions and the Contract Documents.

## Polished Floor Testing Results:

Overall Floor Flatness (FF): \_\_\_\_\_

Overall Floor Levelness(FL): \_\_\_\_\_

Measured Gloss Value: \_\_\_\_\_

To be accepted, all signatures must be original ink signatures (copies are not allowed).

## CONCRETE FINISHING INSTALLER:

\_\_\_\_\_  
(Subcontractor Signature)\_\_\_\_\_  
(Subcontractor name and address) Phone Number: ( ) \_\_\_\_\_

## CONTRACTOR:

\_\_\_\_\_  
(Contractor Signature)\_\_\_\_\_  
(Contractor name and address) Phone Number: ( ) \_\_\_\_\_



## SECTION 042200 - CONCRETE UNIT MASONRY

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Concrete masonry units.
  - 2. Mortar and grout.
  - 3. Steel reinforcing bars.
  - 4. Masonry joint reinforcement.
  - 5. Miscellaneous masonry accessories.
  - 6. Brick.
  - 7. Masonry fill insulation.
- B. Related Sections as required per Project Manual:
  - 1. Section 013300 – “Submittal Procedures”
  - 2. Section 014000 – “Quality Requirements”
  - 3. Section 033000 – “Cast-in-Place Concrete”
  - 4. Section 051200 – “Structural Steel Framing”
  - 5. Section 071900 - Water Repellents: Water repellent coating applied to exterior integrally colored concrete masonry surfaces.

## 1.3 DEFINITIONS

- A. CMU(s): Concrete masonry unit(s).
- B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

## 1.4 PERFORMANCE REQUIREMENTS

- A. Provide structural unit masonry that develops indicated net-area compressive strengths at 28 days as specified on Contract Drawings.
  - 1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

## 1.5 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Owner will engage a qualified testing and inspecting agency to perform tests and inspections as noted below along with inspection schedule items included in the Contract Drawings. Testing agency shall prepare tests and inspection reports and submit to Owner and Owner's Consultants. Allow inspectors access to scaffolding and work areas, as

needed to perform tests and inspections. Retesting of materials that fail to meet specified requirements shall be done at Contractor's expense.

1. Concrete Masonry Unit Test: For each type of unit required, according to ASTM C 140 for compressive strength.
2. Mortar Test (Property Specification): For each mix required, according to ASTM C 109 for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.
3. Mortar Test (Property Specification): For each mix required, according to ASTM C 780 for compressive strength.
4. Grout Test (Compressive Strength): For each mix required, according to ASTM C 1019.

## 1.6 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For the following:
  1. Submit all submittals electronically in PDF format via email, unless otherwise specified, to Architect of Record.
  2. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
  3. Submit an elevation drawing of each reinforced CMU wall that shows:
    - a. Reinforcing bar size, quantity, spacing, length and grade of steel.
    - b. Horizontal and vertical locations of all bearing plates and embed plates.
    - c. Location of each control joint.
    - d. Horizontal and vertical location of all embedded anchors.
    - e. Location and length of lap splices.
  4. Submit details showing proper location of reinforcing bars (vertical and horizontal), bearing plates, embed plates and anchor bolts.
  5. Include masonry notes that concern construction means and methods, grouting procedures, and proper alignment of reinforcing bars (vertical and horizontal), bearing plates, embed plates and anchor bolts.
  6. Prepare shop drawings in accordance with ACI 315. Do not use reproductions of Contract Drawings as shop drawings.
  7. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
- C. Qualification Data: For testing agency.
- D. Material Certificates: Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards. For each type and size of the following:
  1. Masonry units.
    - a. Include material test reports substantiating compliance with requirements.
    - b. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.
  2. Cementitious materials. Include brand, type, and name of manufacturer.
  3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
  4. Grout mixes. Include description of type and proportions of ingredients.
  5. Reinforcing bars.
  6. Joint reinforcement.
  7. Anchors, ties, and metal accessories.
- E. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
  1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109 for compressive strength.

2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.
- F. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.
- G. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

## 1.7 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1093 for testing indicated.
- B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.
- C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.
- D. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.
- E. Sample Panels: Build sample panels to verify selections made under sample submittals and to demonstrate aesthetic effects. Comply with requirements in Section 014000 "Quality Requirements" for mockups.
  1. Build sample panels for each type of exposed unit masonry construction as specified by the architect.
  2. Where masonry is to match existing, erect panels adjacent and parallel to existing surface.
  3. Protect approved sample panels from the elements with weather-resistant membrane.
  4. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing.
    - a. 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 Architect in writing.
- F. Pre-installation Conference: Conduct conference at Project site.

## 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

- C. Store aggregates where grading and other required characteristics can be maintained, and contamination avoided.
- D. Deliver pre-blended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store pre-blended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in covered weatherproof dispensing silos.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

## 1.9 PROJECT CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
  - 1. Extend cover a minimum of 24 inches down both sides of walls and hold cover securely in place.
- B. Do not apply uniform roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
  - 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
  - 2. Protect sills, ledges, and projections from mortar droppings.
  - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
  - 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
  - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than 7 days after completing cleaning.
- E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

## PART 2 - PRODUCTS

### 2.1 MASONRY UNITS, GENERAL

- A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.

- B. Fire-Resistance Ratings: Where indicated on Contract Drawings, provide units that comply with requirements for fire-resistance ratings indicated as determined by testing according to ASTM E 119, by equivalent masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

## 2.2 CONCRETE MASONRY UNITS

- A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated on Contract Drawings.
  - 1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
  - 2. Provide square-edged units for outside corners unless otherwise indicated.
- B. Integral Water Repellent: Provide units made with integral water repellent.
  - 1. Integral Water Repellent: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested according to ASTM E 514 as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive, with test period extended to 24 hours, shall show no visible water or leaks on the back of test specimen.
- C. CMUs: ASTM C 90.
  - 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength as specified on Contract Drawings.
  - 2. Density Classification: Lightweight unless otherwise indicated on Contract Drawings.
  - 3. Size :
    - a. Manufacturer's standard units with nominal face dimensions of 16" long x 8" high x 8" deep.
    - b. Manufacturer's veneer units with nominal face dimensions of 16" long x 8" high x 4" deep.
    - c. Manufactured to dimensions 3/8 inch less than nominal dimensions.
  - 4. Exposed Faces: Provide color and texture matching the range represented on Architect's drawings.
- D. Concrete Building Brick: ASTM C 55.
  - 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength as specified on Contract Drawings.
  - 2. Density Classification: Lightweight unless otherwise indicated on Contract Drawings.
  - 3. Size (Width): Manufacturer's standard units with nominal face dimensions of 16" long x 4" high.
    - a. Manufactured to dimensions 3/8 inch less than nominal dimensions.
  - 4. Exposed Faces: Provide color and texture matching the range represented on Architect's drawings.
  - 5. Manufacturers:
    - a. Spec Brik  
Tel: (800) 789-0872  
Contact: Bill Dawson
    - b. Quik Brik by Oldcastle Architectural  
375 Northridge Road, Suite 250  
Atlanta, GA 30350  
Tel: (877) 506-2745

## 2.3 MASONRY LINTELS

- A. General: Provide one of the following:
- B. Masonry Lintels: Built-in-place masonry lintels made from bond beam CMUs with reinforcing bars placed as indicated and filled with coarse grout. Temporarily support built-in-place lintels until cured.

## 2.4 BRICK

- A. Face Brick:
  - 1. Face brick or hollow brick, ASTM C 216, type FBS or ASTM C 652, type HBS class H40V, Grade SW.
  - 2. Manufacturer: Acme Brick, Ft. Worth, TX (817) 332-4101.
  - 3. Colors: Refer to drawing.
  - 4. Substitutions not allowed.

## 2.5 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated on Contract Drawings.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- D. Masonry Cement: Not allowed.
- E. Mortar Cement: ASTM C 1329.
- F. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979. Use only pigments with a record of satisfactory performance in masonry mortar and demonstrated stability and colorfastness.
- G. Stain-Resistant Pointing Mortar: One-part Portland cement, 1/8 part hydrated lime, and two parts graded (80 mesh) aggregate, proportioned by volume. Add aluminum tristearate, calcium stearate, or ammonium stearate equal to 2 percent of Portland by weight.
  - 1. Packaged Dry Mortar: ASTM C387, Type N, using gray color cement.
  - 2. Hydrated Lime: ASTM C207, Type N.
  - 3. Quicklime: ASTM C5, non-hydraulic type.
  - 4. Mortar Aggregate: ASTM C144
- H. Colored Cement Product: Packaged blend made from Portland cement and hydrated lime or mortar cement and mortar pigments, all complying with specified requirements, and containing no other ingredients.
- I. Aggregate for Mortar: ASTM C 144.
  - 1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
  - 2. For joints less than 1/4-inch-thick, use aggregate graded with 100 percent passing the No. 16 sieve.



3. White-Mortar Aggregates: Natural white sand or crushed white stone.
  4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
- J. Aggregate for Grout: ASTM C 404.
- K. Mortar Color (Brick): Uncolored natural gray.
- L. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
- M. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs, containing integral water repellent by same manufacturer.
- N. Water: Potable.

## 2.6 REINFORCEMENT

- A. Uncoated Steel Reinforcing Bars: ASTM A 615 or ASTM A 996, Grade 60.
- B. Masonry Joint Reinforcement, General: ASTM A 951.
1. Interior Walls: Hot dip galvanized, carbon steel.
  2. Exterior Walls: Hot dip galvanized, carbon or stainless steel.
  3. Wire Size for Side Rods: 0.148-inch diameter.
  4. Wire Size for Cross Rods: 0.148-inch diameter.
  5. Wire Size for Veneer Ties: 0.148-inch diameter.
  6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
  7. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.
- C. Masonry Joint Reinforcement for Single-Wythe Masonry: Ladder type with single pair of side rods.

## 2.7 MISCELLANEOUS ANCHORS

- A. Anchor Bolts: Headed steel bolts complying with ASTM A 563 hex nuts and, where indicated, flat washers; hot dip galvanized to comply with ASTM A 153, Class C; of dimensions indicated.

## 2.8 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Pre-molded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.
- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 or PVC, complying with ASTM D 2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

- D. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated on Contract Drawings.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Dayton Superior Corporation, Dur-O-Wal Division; D/A 810, D/A 812 or D/A 817.
    - b. Heckmann Building Products Inc.; No. 376 Rebar Positioner.
    - c. Hohmann & Barnard, Inc.; #RB or #RB-Twin Rebar Positioner.
    - d. Wire-Bond; O-Ring or Double O-Ring Rebar Positioner.

## 2.9 MASONRY-CELL INSULATION

- A. Loose-Granular Fill Insulation: Perlite complying with ASTM C 549, Type II (surface treated for water repellency and limited moisture absorption) or Type IV (surface treated for water repellency and to limit dust generation).
- B. Molded-Polystyrene Insulation Units: Rigid, cellular thermal insulation formed by the expansion of polystyrene-resin beads or granules in a closed mold to comply with ASTM C 578, Type I. Provide specially shaped units designed for installing in cores of masonry units.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Concrete Block Insulating Systems; Korfil.
    - b. Shelter Enterprises Inc.; Omni Core.
- C. Foamed-In-Place Masonry Insulation: Foam in place insulation in core cells of concrete masonry unit (CMU) walls, wythe cavities or exterior walls. For pressure injection method patch holes with mortar to resemble adjacent surfaces.

## 2.10 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated on Contract Drawings.
1. Do not use calcium chloride in mortar or grout.
  2. Use Portland cement-lime or mortar cement mortar unless otherwise indicated on Contract Drawings.
  3. For exterior masonry, use Portland cement-lime or mortar cement mortar.
  4. For reinforced masonry, use Portland cement-lime or mortar cement mortar.
  5. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Pre-blended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a pre-blended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C 270, Property Specification. Provide the following types of mortar for applications stated unless another type is indicated on Contract Drawings.
1. For masonry below grade or in contact with earth, use Type S.
  2. For reinforced masonry, use Type S.
  3. For mortar parge coats, use Type S.

4. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type S.
  5. For interior non-load-bearing partitions, Type S.
- D. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.
1. Pigments shall not exceed 10 percent of Portland cement by weight.
  2. Pigments shall not exceed 5 percent of mortar cement by weight.
  3. Mix to match block colors.
  4. Application: Use pigmented mortar for exposed mortar joints as specified by the Architect:
- E. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.
1. Mix to match block color.
  2. Application: Use colored aggregate mortar for exposed mortar joints as specified by the Architect:
- F. Grout for Unit Masonry: Comply with ASTM C 476.
1. Use grout of type indicated on Contract Drawings or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
  2. Proportion grout in accordance with ASTM C 476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated on drawings, but not less than 2000 psi.
  3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143.
  4. Add admixtures in accordance with manufacturer's instructions; mix uniformly.
  5. Do not use anti-freeze compounds to lower the freezing point of grout.

## 2.11 TIES AND ANCHORS

- A. Masonry Veneer Anchors: Provide galvanized anchor systems as specified below Hohmann & Barnard or equivalent by other manufacturers.
1. Seismic Masonry Veneer Anchors: Grip-Lok Ladder Reinforcement #285 by Hohmann & Barnard. Adjustable wall ties welded to ladder type horizontal joint reinforcement and seismic plate pintle.
  2. Seismic Masonry Veneer Anchors: 270 S.I.S Loxall Ladder Eye Adjustable Wire with Seismiclip Interlock System and continuous 9 Gauge wire, Single Veneer, Type 304 Stainless Steel, by Hohmann & Barnard.

## 2.12 ACCESSORIES

- A. Through-Wall Flashing: Sheet copper, total metal weight 5 ounces per sq ft, laminated with protective coating on both sides. Provide one of the following:
1. Copper Fabric or Copper Sealtight 2000, by Advanced Building Products, Inc., Springvale, ME (800) 252-2306.
  2. Copper Fabric, by Sandell Manufacturing Co., Schenectady, NY (800) 283-3888.
  3. York Multi Flash 500, by York Manufacturing, Inc., Sanford, ME (800) 551-2828.
- B. Adhesive: As recommended by flashing material manufacturer.
- C. Weeps: Galvanized steel tubes or #341 Plastic Weep Tube 3/8" Dia. X 4" long by Hohmann & Barnard.

- D. Cavity Wall Drainage System: Provide one of the following:
  - 1. Mortar Net by Mortar Net USA, Gary, IN (800) 664-6638.
  - 2. Mortar Guard by Fiberweb, Dedham, MA (781) 461-1946.
- E. Grout Barrier: Provide the following:
  - 1. MGS Grout Screen by Hohmann & Barnard, Inc.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
  - 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
  - 2. Verify that foundations are within tolerances specified.
  - 3. Verify that reinforcing dowels are properly placed.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.
- C. Coordinate and make provisions for installation of anchors, bolts, hangers, frames, insulation, dampproofing, and other items built into masonry work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 INSTALLATION, GENERAL

- A. Build chases and recesses to accommodate items specified in this and other Sections.
  - 1. Provide no less than 8 inches of masonry between chase or recess and jamb of openings, and between adjacent chases and recesses.
- B. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.
- C. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- D. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested in accordance with ASTM C 67. Allow units to absorb water until damp but not wet at time of laying.

#### 3.3 TOLERANCES

- A. Dimensions and Locations of Elements:
  - 1. For dimensions in cross section or elevation do not vary by more than plus 1/2 inch or minus 1/4 inch.
  - 2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/2 inch.

3. For location of elements in elevation do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2-inch total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls do not vary from level by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
5. For lines and surfaces do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2 inch maximum.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch.

### 3.4 COURSING

- A. Lay brick in running bond.

### 3.5 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated on contract drawings, lay exposed masonry in running bond; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- C. Lay concealed masonry with all units in a wythe in running bond. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar before laying fresh masonry.
- E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

- F. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.
- G. Provide special jamb units where required to execute window and control joint details. Maintain sealant clearances at doors, windows and other openings.
- H. Provide lintels at opening of masonry work as necessary to form opening for in-wall equipment, through-wall ducts and piping and as otherwise needed to support openings over 8 inches wide.
- I. Fill cores in hollow CMUs with grout 24 inches under bearing plates, joists, beams, lintels, posts, and similar items unless otherwise indicated on Contract Drawings.
- J. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated on Contract Drawings.
  - 1. Support top of wall laterally as indicated on Contract Drawings. Install compressible filler in joint between top of partition and underside of structure above.
  - 2. If not indicated otherwise on Contract Drawings, fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches o.c. unless otherwise indicated.
  - 3. At fire-rated partitions, treat joint between top of partition and underside of structure above.

### 3.6 MORTAR BEDDING AND JOINTING

- A. Lay hollow CMUs as follows:
  - 1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
  - 2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
  - 3. With webs fully bedded in mortar in grouted masonry, including starting course on foundations.
  - 4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.
- B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Set cast-stone trim units in full bed of mortar with full vertical joints. Fill dowel, anchor, and similar holes.
  - 1. Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
  - 2. Allow cleaned surfaces to dry before setting.
- D. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated on Contract Drawings.
- E. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

### 3.7 PLACING AND BONDING

- A. Cavity Space:

1. Install cavity drainage system in accordance with manufacturer's instructions. Do not let mortar fall into cavity air space, clean out promptly.
2. Install through-wall flashings above shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, at bottom of walls, and where indicated on Drawings.
3. Install weep holes in veneer at 32 inches on center horizontally above through-wall flashings.

### 3.8 MASONRY-CELL INSULATION

- A. Pour granular insulation into cavities to fill void spaces. Maintain inspection ports to show presence of insulation at extremities of each pour area. Close the ports after filling has been confirmed. Limit the fall of insulation to one story high, but not more than 20 feet.
- B. Install molded-polystyrene insulation units into masonry unit cells before laying units.

### 3.9 MASONRY JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
  1. Space reinforcement not more than 16 inches o.c.
  2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
  3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.
- B. Interrupt joint reinforcement at control joints unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.
- E. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

### 3.10 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

- A. Anchor masonry to structural steel and concrete where masonry abuts or faces structural steel or concrete to comply with the following:
  1. Provide an open space not less than 1 inch wide between masonry and structural steel or concrete unless otherwise indicated on Contract Drawings. Keep open space free of mortar and other rigid materials.
  2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
  3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

### 3.11 CONTROL JOINTS

- A. General: Install control joint materials in unit masonry as masonry progresses. Do not allow materials to span control joints without provision to allow for in-plane wall or partition movement.
- B. Form control joints in concrete masonry using one of the following methods:

1. Locate 3/8-inch-wide control joints as indicated on Contract Drawings. Keep vertical joints straight, true and continuous from top to bottom of masonry.
2. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
3. Install preformed control-joint gaskets designed to fit standard sash block.
4. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake out joint for application of sealant.
5. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete for application of sealant.
6. Reinforcing and grout for bond beams at floor, roof or top of wall shall be continuous through the control joints.

### 3.12 LINTELS

- A. Provide masonry lintels where shown and where openings of more than 24 inches are shown without structural steel or other supporting lintels.
- B. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated on Contract Drawings.

### 3.13 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
  1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
  2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602. Place steel reinforcement, grouted spaces and bond beams as work progresses and as follows:
  1. Accurately position and secure against displacement from locations shown. Horizontal reinforcement may be placed as work progresses. All vertical reinforcing shall be in place prior to grouting and shall be held in position by means of bar positioners as shown on Contract Drawings.
  2. Make splices in bars as shown on Contract Drawings. Lapped splices for reinforcement shall be as specified on the Contract Drawings. Provide lap splices of greater lengths when indicated on Contract Drawings. Welded or mechanical splices shall develop 1.25 times the strength of the reinforcement.
- C. Grouting: Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
  1. Limit height of vertical grout pours to not more than 12'-8" or the distance between bond beams, whichever is less.
  2. Provide cleanouts at the bottom course of grout lifts for pours over 5'-0" in height. Provide cleanouts at the bottom course of each vertical bar location in partially grouted masonry. Provide cleanouts at 32 inches on center along the bottom course of grout lifts in fully grouted masonry. Use cleanouts to remove all mortar droppings and debris and ensure proper placement of reinforcement.



3. Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure. Allow masonry to cure a minimum of 4 hours prior to placing grout for pour heights between 5'-0" and 12'-8". Increase curing time to a minimum of 8 hours in cold or dry weather conditions.
4. Stop grout 2" below top of masonry when grout is to be stopped for 1 hour or more. All horizontal steel shall be fully embedded in grout.
5. Consolidate pours exceeding 12 inches in height by mechanical vibration and reconsolidate by mechanical vibration after initial water loss and settlement has occurred.
6. The grouting of any section of wall shall be completed in one day with no interruptions greater than one hour.

### 3.14 BRACING

- A. Provide adequate temporary bracing of masonry walls until it has cured and permanent structural braces (i.e. roof diaphragm) is in place. Bracing of masonry walls is means and methods of construction and is solely the responsibility of the General Contractor and his masonry sub-contractors.
  1. Provide bracing in accordance with Mason Contractors Association of America (MCAA) Standard Practice for Bracing Masonry Walls Under Construction.
  2. Design bracing under supervision of an independent Professional Engineer hired by the contractor and licensed in the state in which the project is located.
- B. Allow 16 hours to elapse after completion of masonry walls and columns before allowing uniform roof loading construction.
- C. Allow an additional 48 hours before allowing construction of concentrated loads on masonry walls and columns.

### 3.15 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage a qualified testing and inspecting agency to perform tests and inspections as noted below along with inspection schedule items included in the Contract Drawings. Testing agency shall prepare tests and inspection reports and submit to Owner and Owner's Consultants. Allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections. Retesting of materials that fail to meet specified requirements shall be done at Contractor's expense.
- B. Inspections: Level 1 special inspections according to the "International Building Code."
  1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
  2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
  3. Place grout only after inspectors have verified proportions of site-prepared grout.
- C. Testing Prior to Construction: One set of tests.
- D. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.
- E. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.
- F. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.

### 3.16 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
  - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
  - 2. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
  - 3. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
  - 4. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

### 3.17 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.
- B. Excess Masonry Waste: Remove excess masonry waste, and legally dispose of off Owner's property.

END OF SECTION 042200

## SECTION 054000 - COLD FORMED METAL FRAMING

## PART 1 GENERAL

## 1.1 SUMMARY

- A. Section Includes:
  - 1. Cold formed steel stud interior framing 20 gauge and heavier.
- B. Related Requirements as required per Project Manual:
  - 1. Section 051200 - Structural Steel Framing: Connecting to structural building framing.
  - 2. Section 052100 - Steel Joist Framing: Connecting to steel joists.
  - 3. Section 053100 - Steel Decking: Connecting to decking
  - 4. Section 061000 - Rough Carpentry: Wood furring strips, plywood, and blocking.
  - 5. Section 072100 - Thermal Insulation: Thermal insulation installed in exterior framing.
  - 6. Section 092900 - Gypsum Board: Non-load bearing steel stud partition framing lighter than 20 gauge.

## 1.2 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.
- B. American Iron and Steel Institute (AISI):
  - 1. North American Specification for the Design of Cold-Formed Steel Structural Members.
  - 2. Standard for Cold-Formed Steel Framing.
- C. ASTM International (ASTM):
  - 1. ASTM A 36 - Carbon Structural Steel.
  - 2. ASTM A 123 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
  - 3. ASTM A 1003 - Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members.
  - 4. ASTM C 1513 - Steel Tapping Screws for Cold-Formed Steel Framing Connections.
- D. American Welding Society (AWS):
  - 1. AWS D1.1 - Structural Welding Code - Steel.
  - 2. AWS D1.3 - Structural Welding Code - Steel Sheet.
- E. Gypsum Association (GA):
  - 1. GA-216 - Application and Finishing of Gypsum Board.
- F. Steel Structures Painting Council (SSPC):
  - 1. SSPC-Paint 20 - Zinc-Rich Coating Type I Inorganic And Type II Organic.

## 1.3 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in the installation of cold formed metal framing components with minimum five years documented experience.
- B. Qualifications for Welding Work: Qualify welding operators in accordance with Standard Qualification Procedures as required by AWS D1.1.

## 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Transport, handle, store, and protect products in compliance with the requirements of Section 016000.

- B. Protect metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.
- C. Store and protect metal framing products with waterproof covering; ventilate to avoid condensation.
- D. Where framing is stored outdoors, stack materials off ground, supported on level platform, fully protected from weather.

## PART 2 PRODUCTS

### 2.1 MATERIALS

- A. Comply with AISI North American Specification for the Design of Cold-Formed Steel Structural Members and Standard for Cold-Formed Steel Framing.
- B. Steel Sheet: ASTM A 1003, Structural Grade, Type H, metallic coated, Grade: ST33H (33 ksi) unless otherwise indicated, Coating G60.
- C. Material Thickness: Gauge shown on Drawings shall have the following minimum base metal thickness.
  - 1. 20 gauge: 33 mils.
  - 2. 18 gauge: 43 mils.
  - 3. 16 gauge: 53 mils.

### 2.2 FRAMING AND ACCESSORIES

- A. Interior Load-Bearing Steel Joists: Manufacturer's standard C-shaped steel joists, of web depths indicated, with stiffened flanges.
- B. Partition Floor Tracks and Runners: Galvanized sheet steel, C-shaped; same depth and gauge as studs; tight fit; solid web.
- C. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and same minimum base-metal thickness as steel studs.
- D. Deflection (Capture) Track: Deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth as shown to contain studs while allowing free vertical movement, with flanges or legs as shown designed to support horizontal and lateral loads. Provide fasteners as indicated on Drawings.
  - 1. Contractor's Option: One of the following manufacturer's standard double or single deflection tracks modified as required for web depth as shown.
    - a. VertiClip or VertiTrack by The Steel Network, Durham, NC (888) 474-4876. If this option is used, track may be 20 gauge (30 mil) for all stud sizes.
    - b. FastTop Clip by ClarkDietrich Building Systems, West Chester, OH (513) 870-1100.
    - c. SLP-TRK by Brady Innovations as distributed by ClarkDietrich.
- E. Steel Shapes and Clips: ASTM A 36, zinc coated by hot-dip process according to ASTM A 123.
- F. Framing Attachment Angles: Galvanized sheet steel, size, shape and configuration as indicated on Drawings, 14 gauge, unless indicated otherwise on Drawings.
  - 1. Contractor's Option: Contact ClarkDietrich Clip Express (866) 638-1908 for alternative selections.
- G. Ceiling Joists and Runners: Galvanized sheet steel, C-shaped. 6" depth.
- H. Flat Metal Straps and Plates: Galvanized sheet steel, gauge, shape, and configuration as indicated on Drawings.
  - 1. Contractor's Option: In lieu of 2-inch continuous metal strap at deflection (capture) tracks, Contractor may provide one of the following:

- a. Bridge Bar by The Steel Network.
- b. TradeReady Spazzer 5400 bridging and spacing bar by ClarkDietrich.

## 2.3 FASTENERS

- A. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load.
- B. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.
- C. Framing to Framing: ASTM C 1513; 5/8-inch Type S-12 low-profile head corrosion-resistant self-drilling self-tapping steel screws.
- D. Framing to Attachment Angle Fasteners: #12 diameter pan head corrosion-resistant self-drilling self-tapping steel screws.
- E. Wall Floor Track Anchorage Device: Carbon steel wedge type expansion anchor; minimum 3/8-inch diameter x minimum 1-1/2-inch embedment unless noted otherwise on Drawings.
- F. Wall Furring to Masonry Wall Fasteners: Hex head screw anchors; minimum 1/4-inch diameter x minimum 1-1/8-inch embedment unless noted otherwise on Drawings.
- G. Furring Channel to Masonry Surface Fasteners: Low velocity powder-actuated drive pins of size to suit application.
- H. Welding Materials: AWS D1.3.
- I. Wood Furring, Blocking, and Plywood, Attached to Framing Fasteners: Specified in Section 061000.

## 2.4 FINISHES

- A. Galvanizing: G60 coating class.
- B. Galvanizing Repair Paint: SSPC-Paint 20, Type II - organic.

## 2.5 SUBSTITUTIONS

- A. Comply with the requirements of Section 016000.

# PART 3 EXECUTION

## 3.1 EXAMINATION

- A. Examine existing conditions and adjacent areas where products will be installed and verify that conditions conform to product manufacturer's requirements. Verify that building framing components are ready to receive work. Verify that rough-in utilities are in-place and located where required. Do not proceed until unsatisfactory conditions have been corrected.

## 3.2 INSTALLATION, GENERAL

- A. Install cold-formed metal framing in accordance with AISI North American Standard for Cold-Formed Steel Framing and to manufacturer's written instructions unless more stringent requirements are shown or specified.

- B. Install system to provide for movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.
- C. Install system to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.
- D. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.
- E. Install framing members in one-piece lengths.
- F. Perform field welding in accordance with AWS D1.3.

### 3.3 INSTALLATION - STUD FRAMING

- A. Install studs and fasteners in accordance with manufacturer's published instructions and, where gypsum board is attached to studs, install studs in accordance with GA-216 and ASTM C 1007.
- B. Metal Stud Spacing: 16 inches on center, maximum, unless otherwise shown on Drawings.
- C. Align stud web openings horizontally.
- D. Construct corners using minimum three studs.
- E. Place studs as indicated on Drawings, minimum 2 inches from abutting walls.
- F. Erect studs one-piece full length. Splicing of studs not permitted.
- G. Erect studs, brace, and reinforce to develop full strength to meet design requirements.
- H. Install headers at partition openings using load-bearing C-shaped joists.
- I. Install framing between studs for attachment of mechanical and electrical items.
- J. Coordinate placement of insulation in multiple stud spaces made inaccessible after erection.
- K. Install intermediate studs above and below openings to match wall stud spacing.
- L. Fasten studs adjacent to door and window frames, partition intersections, and corners to top and bottom runner flanges in double-stud fashion with metal lock fastener tools.
  - 1. Securely fasten studs to jamb and head anchor clips of door and borrowed-light frames.
  - 2. Place horizontally a cut-to-length section of runner with web-flange bent at each end, fasten with minimum one screw per flange.
  - 3. Position a cut-to-length stud (extending to top runner) at vertical panel joints over door frame header.
- M. Install bridging for stud partitions over 8 feet high at mid-height with 1-1/2 inch rolled channels through studs and screw attach in place using clip angles. Lap channels by nesting one inside the other to a length of at least 8 inches and wire fasten together.
- N. Blocking: Screw attach wood blocking between studs. Install blocking for support of plumbing fixtures, wall cabinets, toilet accessories, and hardware.
- O. Where optional framing products by the named manufacturers are specified in Part 2 above in lieu of conventional components specified, install in accordance with manufacturers recommendations.

- P. Touch up field welds and damaged galvanized surfaces with primer.
- Q. Fastening: Fasten framing in accordance with manufacturer's published instructions and schedule below unless indicated otherwise on Drawings.

<b>FASTENERS</b>	<b>MINIMUM CONNECTION</b>
Floor Track to Concrete	1 Anchor at 36 inches on center.
Partition Stud to Floor Track	1 Screw each side at flange.
Stud Web to Stud Web	2 Screws.
Plates and Straps to Studs	2 Screws.
Lateral Bracing to Partition Stud Using Clip Angles	2 Screws to stud and 2 Screws to cold rolled channel.
Runner to Header	1 Screw at 16 inches on center, maximum 6 inches from each end.
Welded Connections	Indicated on Drawings.

### 3.4 INSTALLATION - JOIST FRAMING

- A. Install joists and fasteners in accordance with manufacturer's published instructions.
- B. Make provisions for erection stresses. Provide temporary alignment and bracing.
- C. Place joists at locations and spacing as indicated on Drawings.
- D. Touch-up field welds and damaged galvanized surfaces with primer.
- E. Fastening: Indicated on Drawings.

### 3.5 INSTALLATION - CEILING JOISTS

- A. Install joists and fasteners in accordance with manufacturer's published instructions and, where gypsum board is attached to joists, install joists in accordance with GA-216, and ASTM C 1007.
- B. Ceiling Joist Spacing: 16 inches on center beginning from center of room unless otherwise shown on Drawings.
- C. Install joists in direction of shortest span, parallel and level, with lateral bracing and bridging.
- D. Install joists in one-piece full length. Splicing of joists not permitted.
- E. Install perimeter joist runner track sized to match joists. Attach joist runner track to wall framing with minimum 2 screws per stud and at corners and ends.
- F. Attach joist ends to joist runner tracks with minimum 1 screw each side at each flange.
- G. Install bridging at 48 inches on center beginning from center of room with 1-1/2 inch rolled channels screw attached to joists.
  - 1. Stagger bridging at light fixture locations as required.

### 3.6 INSTALLATION - FURRING

- A. Furring Channels: Attach vertically spaced at maximum 16 inches on center, unless otherwise shown on Drawings, to masonry and concrete surfaces with specified powder driven fasteners staggered 24 inches on center on opposite flanges.
- B. Wall Furring:

1. Secure top and bottom runners to structure.
2. Space metal furring at maximum 16 inches on center unless otherwise shown on Drawings.

3.7 INTERFACE WITH OTHER WORK

- A. Coordinate erection of studs with hollow metal door frames.
- B. Coordinate installation of anchors, supports, and blocking for mechanical, electrical, and building accessory items installed within framing.

3.8 FIELD QUALITY CONTROL

- A. Field quality control shall be the responsibility of the Contractor in accordance with Section 014000. Field quality control testing and inspection shall be at the discretion of the Contractor as necessary to assure compliance with Contract requirements.

END OF SECTION 054000



CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 054000 – COLD FORMED METAL FRAMING

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the cold formed metal framing is installed and is in general conformance with the Contract Documents, applicable Codes, and shop drawings. The cold formed metal framing has been provided in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

COLD FORMED METAL FRAMING INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_



## SECTION 055000 - METAL FABRICATIONS

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section Includes:
  - 1. Shop fabricated ferrous metal items, galvanized and prime painted.
- B. Related Requirements as required per Project Manual:
  - 1. Section 013300 – Submittal Procedures.
  - 2. Section 051200 - Structural Steel Framing: Connection of miscellaneous framing and supports to structural steel.
  - 3. Section 099000 - Painting and Coating: Field painted finishes.

## 1.2 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.
- B. American National Standards Institute (ANSI):
  - 1. ANSI A 14.3 - Ladders, Fixed, Safety Requirements.
- C. ASTM International (ASTM):
  - 1. ASTM A 36 - Carbon Structural Steel.
  - 2. ASTM A 53 - Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
  - 3. ASTM A 123 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
  - 4. ASTM A 153 - Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
  - 5. ASTM A 240 - Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
  - 6. ASTM A 307 - Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
  - 7. ASTM A 325 - Structural Bolts, Heat Treated, 120/105 ksi Minimum Tensile Strength.
  - 8. ASTM A 500 - Cold-formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
  - 9. ASTM A 591 - Steel Sheet, Electrolytic Zinc-Coated, for Light Coating Mass Applications.
  - 10. ASTM A 653 - Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
  - 11. ASTM A 666 - Annealed or Cold-Worked Austenitic Stainless-Steel Sheet, Strip, Plate, and Flat Bar.
  - 12. ASTM A 1008 - Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, Baked Hardenable.
  - 13. ASTM A 1011 - Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
- D. American Welding Society (AWS):
  - 1. AWS D1.1 - Structural Welding Code.
  - 2. AWS D1.3 - Structural Welding Code - Sheet Steel.
- E. National Association of Architectural Metal Manufacturers (NAAMM):
  - 1. Metal Finishes Manual for Architectural and Metal Products.
- F. Steel Structures Painting Council (SSPC):
  - 1. SSPC-Paint 20 - Zinc-Rich Coating Type I - Inorganic and Type II - Organic.
  - 2. SSPC-Paint 25 - Zinc Oxide, Alkyd, Linseed Oil Primer for Use Over Hand Cleaned Steel Type I And Type II.
  - 3. SSPC-SP 3 - Power Tool Cleaning.

4. SSPC-PA 1 - Shop, Field, and Maintenance Painting of Steel.

### 1.3 SUBMITTALS

- A. Submittal Procedures: Unless otherwise specified herein, submit in accordance with procedures specified in Section 013300. Submit all submittals electronically in PDF format via email, unless otherwise specified, to Architect of Record.
- B. Shop Drawings: Submit within 10 working days of Contract Date.
  1. Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.
  2. Include erection drawings, elevations, and details where applicable.
  3. Indicate welded connections using standard AWS welding symbols. Indicate net weld lengths.
  4. Prepare shop drawings under the supervision of a licensed structural Professional Engineer.

### 1.4 QUALITY ASSURANCE

- A. Welder Qualifications: Qualify welding operators in accordance with Standard Qualification Procedures as required by AWS D1.1.

### 1.5 DELIVERY, STORAGE AND HANDLING

- A. Transport, handle, store, and protect products in compliance with the requirements of Section 016000 and manufacturer's recommendations.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Steel Plates, Shapes and Bars: ASTM A 36.
- B. Bolts, Nuts, and Washers: ASTM A 325 and ASTM A 307.
- C. Cold Rolled Steel Sheet: ASTM A 1008.
- D. Hot Rolled Steel Sheet: ASTM A 1011.
- E. Galvanized Steel Sheets:
  1. Structural: ASTM A 653 Structural Quality, G90.
  2. Galvanized Sheet Steel: ASTM A 591, Class C.
- F. Stainless-Steel Sheet, Strip, and Plate: ASTM A 240 or ASTM A 666, Type 304.
- G. Steel Tubing: ASTM A 500, Grade B.
- H. Steel Piping: ASTM A 53.
- I. Welding Materials: AWS D1.1 and AWS D1.3 type required for materials being welded.
- J. Primers:
  1. Shop application and field touch-up: SSPC Paint 25.
  2. Touch-up Primer for Galvanized Surfaces: SSPC Paint 20.
  3. Color: To match primer used on steel roof deck and joists.
- K. Concrete Inserts: Cast steel or malleable bolts, washers, and shims; galvanized.

- L. Grout: Specified in Section 051200.

## 2.2 FABRICATION

- A. Verify dimensions on site prior to shop fabrication.
- B. Fabricate items with joints tightly fitted and secured.
- C. Fit and shop assemble in largest practical sections for delivery to Site.
- D. Grind exposed welds flush and smooth with adjacent finished surface. Ease exposed edges to small uniform radius.
- E. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.
- F. Supply components required for anchorage of metal fabrications. Fabricate anchorage and related components of same material and finish as metal fabrication, except where specifically noted otherwise.

## 2.3 FINISHES

- A. Finish metal fabrications after assembly. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" recommendations for applying and designating finishes. Shop prime ferrous-metal items not indicated to be galvanized.
- B. Prime Painting:
  - 1. Prime paint in shop as scheduled.
  - 2. Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 3, "Power Tool Cleaning."
  - 3. Apply shop primer to comply with SSPC-PA 1 for shop painting.
  - 4. Do not prime surfaces in direct contact bond with concrete or where field welding is required.
  - 5. Prime paint items scheduled with one coat. Touch up with same primer.
- C. Galvanizing: Hot dip galvanize items indicated to be galvanized to comply with ASTM A 123 or ASTM A 153 as applicable. Galvanize exterior items and those items indicated on Drawings and specified herein to be galvanized to minimum 2.0 oz./sq. ft. zinc coating.
- D. Field Finish Painting: Finish paint after installation as shown on Drawings or specified herein in accordance with Section 099000.
- E. Factory Finish Coating: Where specified hereinafter to be factory finished, finish with manufacturer's standard factory finish suitable for the application.

## 2.4 SUBSTITUTIONS

- A. Comply with the requirements of Section 016000.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Obtain Owner's approval prior to field cutting or making adjustments not scheduled.
- B. Clean and strip field-primed steel items to bare metal where field welding is scheduled.
- C. Make provision for erection loads with temporary bracing. Keep work in alignment.

### 3.2 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Use grout for setting metal fabrications.
- C. Perform field welding in accordance with AWS D1.1 or D1.3, as applicable. After installation, grind sight-exposed field welds smooth, touch-up welds, scratched, or damaged surfaces with primer.

### 3.3 SCHEDULE

- A. Provide items as scheduled herein and as indicated on Drawings.
- B. Miscellaneous Framing and Supports: Furnish steel framing and support not specified under Section 051200. Fabricate welded construction in as large units as possible. Drill and tap for hardware and other items. Include anchors required for building into work of other Sections.
  - 1. Interior: Prime paint finish, gray.
  - 2. Exterior: Galvanized.
- C. Rough Hardware: Custom fabricated bolts, plates, anchors, hanger, dowels, and other miscellaneous steel and iron shapes required for framing, supporting, and anchoring other construction. Galvanized unless otherwise indicated on Drawings.
- D. Field strut angles: Provide L2x2x3/16 field struts at joist panel points as required on Structural Drawings.
- E. Miscellaneous Steel Trim: Profiles and sizes as indicated on Drawings with continuously welded joints and smooth exposed edges. Use concealed field splices where possible. Provide cutouts, fittings, and anchorages. Coordinate assembly and installation into work of other Sections.
  - 1. Interior: Prime paint finish.
  - 2. Exterior: Galvanized.
- F. Fencing Clamp: P1000 Unistrut Channel, 1-5/8-inch series, 12 gauge plain steel, ASTM A1008, by Unistrut, Itasca, IL (630) 787-6100.
- G. Interior and Exterior Steel Pipe Bollards (Footing Mounted): ASTM A 53, Type E (electric resistance welded) or Type S (seamless), Grade B.
  - 1. Pipe Schedule No.: 40.
  - 2. Size: Height and diameter as shown on Drawings.
  - 3. Fill bollard as indicated on Drawings.
  - 4. Finish:
    - a. Painted Bollards: Field prime and finish coated in accordance with Section 099000.
  - 5. Installation: Install in concrete footing as shown on Drawings.
- H. Steel Supports for Overhead Doors: Channels, tubes, and angles as indicated on Drawings for overhead sectional doors. Coordinate fabrication with respective section of work.
- I. Steel Ladder (Interior):
  - 1. Comply with ANSI A14.3 unless otherwise indicated.
  - 2. Side Rails: Steel bars size as shown.
  - 3. Rungs: Solid steel rods size and spacing as shown.
  - 4. Fit rungs in centerline of siderails. Plug-weld and grind smooth on outer rail faces.
  - 5. Provide nonslip surfaces on top of each rung by one of the following methods:
    - a. Coating rung with aluminum-oxide granules set in epoxy-resin adhesive.
    - b. Coating rung with abrasive material metallically bonded to rung.
    - c. Use of manufactured rung filled with aluminum-oxide grout.
  - 6. Finish: Prime paint finish.

7. Attach ladder to structure with steel mounting brackets.
- J. Ladder Safety Extension (For Roof Hatch): LadderUP Safety Post by Bilco, New Haven, CT (800) 366-6530.
  1. Ladder rung continuation grip safety extension above ladder roof hatch opening. Model LU-1.
  2. Provide fasteners with neoprene washers for attachment to roof hatch curb.
  3. Finish: Powder coat yellow.
  4. Assemble and install in accordance with manufacturer's instructions.
  5. Substitutions: Not permitted.

END OF SECTION 055000

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 055000 – METAL FABRICATIONS

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the metal fabrications are installed and are in general conformance with the Contract Documents, applicable Codes, and shop drawings. The metal fabrications have been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

METAL FABRICATION INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_



## SECTION 061000 - ROUGH CARPENTRY

## PART 1 - GENERAL

## 1.1 SUMMARY

## A. Section Includes:

1. Blocking and nailers for roofing system and related metal flashings.
2. Preservative treatment.
3. Concealed blocking behind wall mounted items.
4. Non-structural panel products including the following:
  - a. Backing for electrical and telephone equipment.
  - b. Panels concealed within gypsum board and metal stud partitions.
  - c. Panels attached to chain link fencing.
5. Panel product and framing for wood doors.

## B. Related Requirements:

1. Section 076000 - Flashing and Sheet Metal.

## 1.2 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.
- B. American Lumber Standards Committee (ALSC):
  1. Softwood Lumber Standards.
- C. American Plywood Association (APA):
  1. Grades and Standards.
- D. ASTM International (ASTM):
  1. ASTM A 123 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
  2. ASTM A 153 - Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
  3. ASTM A 653 - Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
  4. ASTM A 307 - Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
  5. ASTM B 117 - Standard Practice for Operating Salt Spray (Fog) Apparatus.
  6. ASTM E 1333 - Test Method for Determining Formaldehyde Concentrations in Air and Emission Rates from Wood Products Using a Large Chamber.
- E. American Society of Mechanical Engineers (ASME):
  1. ASME B18.6.1 - Wood Screws (Inch Series)
- F. American Wood Protection Association (AWPA):
  1. AWPA U1 - User Specification for Treated Wood.
  2. AWPA M4 - Care of Preservative Treated Wood Products.
- G. Department of Commerce (National Institute of Standards and Technology) – Product Standard (DOC):
  1. DOC PS 1 - Construction and Industrial Plywood.
  2. DOC PS 2 - Performance Standard for Wood Based Structural Use Panels.
  3. DOC PS 20 - American Softwood Lumber Standard.
- H. Southern Pine Inspection Bureau (SPIB):
  1. Grading Rules.
- I. Western Wood Products Association (WWPA):

1. Western Lumber Grading Rules.

### 1.3 QUALITY ASSURANCE

- A. Lumber Grading Agency: Lumber to be grade stamped by an agency certified by the Board of Review of the American Lumber Standards Committee (ALSC).
- B. Plywood Grading Agency: Certified by APA.
- C. Composite Wood Products: Hardwood plywood, particleboard, and medium density fiberboard composite wood products specified herein for exterior or interior applications shall meet the requirements for formaldehyde as specified by the California Air Resources Board, Air Toxics Control Measure for Composite Wood as tested in accordance with ASTM E 1333, and Chap 5 of the CALGreen requirements.

### 1.4 DELIVERY, STORAGE AND HANDLING

- A. Transport, handle, store, and protect products in compliance with the requirements of Section 016000.
- B. Provide proper facilities for handling and storage of materials to prevent damage to edges, ends and surfaces.
- C. Keep materials dry. Stack materials off ground a minimum of 12 inches or if on concrete slab-on-grade a minimum of 1-1/2 inches, fully protected from weather. Provide for air circulation around stacks and under coverings.

## PART 2 - PRODUCTS

### 2.1 MATERIALS AND PRODUCTS

- A. Nonstructural Panel: DOC PS 1 or PS 2.
  1. Type 1 (Interior): Grade C-D Plugged exterior grade plywood, Exposure 1, locations and thickness indicated on the Drawings.

### 2.2 FASTENERS

- A. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity: Comply with the treated lumber manufacturer's recommendations for fasteners and metal components in contact with treated lumber.
  1. Fasteners: ASTM A 153, class D for hot dip galvanized fasteners or type 304 or type 316 stainless steel.
  2. Other components: ASTM A 653, G-185, with minimum of 1.85 ounces of zinc coating per square foot coverage or type 304 or type 316 stainless steel.
- B. At no time shall any galvanized metal, stainless steel, or other dissimilar metals be in contact with one another.
- C. Nails, Brads and Staples:
  1. ASTM F 1667 galvanized for exterior locations and high-humidity areas and for treated wood.
  2. ASTM A123 plain finish for other interior locations;
  3. Size and type to suit application, unless otherwise noted.
- D. Bolts, Nuts, Washers, and Lag Screws: ASTM A307, Medium carbon steel; size and type to suit application; galvanized for exterior locations, high humidity areas, and treated wood; plain finish for other interior locations, of size and type to suit application, unless otherwise noted.
- E. Wood Screws: ASME B18.6.1.

- F. Toggle Bolt Fasteners: For anchorage of non-structural items to hollow masonry.
- G. Expansion Shield Fasteners: For anchorage of non-structural items to solid masonry and concrete.
- H. Powder Actuated Fasteners: For anchorage of non-structural items to steel.
- I. Fasteners for Wood and Plywood to Light Gage Metal Framing and Metal Deck (up to 10 gage, 0.1345 inch): Self-drilling flat head wood-to-metal screws.
  - 1. Manufacturers:
    - a. Hilti, Tulsa, OK (800) 879-6000.
    - b. ITW Buildex, Itasca, IL (800) 323-0720.
  - 2. Wood and Plywood Up to 3/4 Inch Thick:
    - a. Hilti: S-WD 8-18 x 1-15/16 PFH #3 Black Phosphated.
    - b. ITW: Traxx 10-16 #3 point.
    - c. Pre-drill wood if wood thickness is greater than 1/2 inch or use heavier fastener specified below.
  - 3. Wood less than or equal to 1-1/8 inch thickness to 18 Gage (0.0478 inch) and 20 Gage (0.0359 inch) Metal:
    - a. Hilti: S-WD 10-24 x 1-1/2 PWH #3 wafer head screw.
    - b. ITW: Traxx 10-16 #3 point.
    - c. Pre-drill wood if wood thickness is greater than 1/2 inch.
  - 4. Wood less than or equal to 1-3/4 inch thickness to 16 Gage (0.598 inch) and Heavier Metal (less than or equal to 0.232 inches):
    - a. Hilti: S-WW 12-24 x 2-1/2 PFH #4 Wings.
    - b. ITW: Traxx 12-24 #4 Point with Wings.
  - 5. Wood less than or equal to 2-inch thickness to 16 Gage (0.598 inch) and heavier metal (less than or equal to 1/4 inch):
    - a. Hilti: S-WW 1/4-20 x 2-3/4 PFH #4 Wings.
- J. Fasteners for Structural Wood Members to Solid Grouted Masonry: Adhesive anchors, size and length as indicated on Drawings.
  - 1. Anchor adhesive: Cartridge type two-component adhesive for embedding anchors.
    - a. HIT HY-70 by Hilti Corp.
    - b. Epcon System, Ceramic 6 by ITW Ramset/Red Head
    - c. Epoxy-Tie SET by Simpson Strong Tie Co., Inc. Pleasanton, CA (800) 925-5099.
    - d. Substitutions: Not permitted.
- K. Fasteners for Non-Structural Wood Members to Masonry: Masonry screw anchor with Phillips or Torx flat head, size and length as shown on the drawings.
  - 1. Hilti: Kwik-Con II fastener.
  - 2. ITW: Tapcon masonry anchor.
- L. Alternate Manufacturers: Subject to compliance with project requirements, fasteners by alternate manufacturers of equal types to those specified may be provided, except where substitutions specifically prohibited.

## 2.3 WOOD TREATMENT

- A. Preservative Pressure Treated Lumber Treatment:
  - 1. Products and Manufacturers: Provide any of the following:
    - a. Wolman CCA by Arch Wood Protection, Smyrna, GA, (770) 801-6600.
    - b. CCA Pressure Treatment by Hoover Treated Wood Products Inc., Thomson, GA, (800) 832-9663.
    - c. SupaTimber by Viance, Charlotte, NC, (800) 421-8661.
  - 2. Treat lumber in accordance with AWPA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.

3. Preservative chemicals shall be acceptable to Authorities Having Jurisdiction and contain no arsenic or chromium where prohibited.
  4. Kiln dry lumber after treatment to 15-19 percent moisture content. Do not use warped material or materials that do not comply with requirements for untreated material. Material to be painted or stained shall have knots and pitch streaks sealed as with untreated wood.
  5. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review and acceptable to Authorities Having Jurisdiction.
- B. Field-Applied Lumber Preservative:
1. Provide the following:
    - a. Inorganic boron.
    - b. Copper naphthenate.
- C. Fire Retardant Treatment:
1. Products and Manufacturers: Provide any of the following:
    - a. Dricon FRT (exterior and interior), by Arch Wood Protection, Smyrna, GA (770) 801-6600.
    - b. Exterior X (exterior) and Pyro-Guard (interior) by Hoover Treated Wood Products Inc., Thomson, GA (800) 832-9663.
    - c. D-Blaze (interior) by Viance, Charlotte, NC (800) 421-8661.
  2. Identify fire retardant treated wood with appropriate classification marking of testing and inspecting agency acceptable to Authorities Having Jurisdiction.
  3. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not bleed through, contain colorants, or otherwise adversely affect finishes.
  4. Kiln dry lumber after treatment to an average moisture content of 19 percent or less.
  5. Kiln dry plywood after treatment to an average moisture content of 15 percent or less.
  6. Chemicals used to treat material shall be free of halogens, sulfates, ammonium phosphate and formaldehyde.
  7. Treatment material shall provide protection against termites and fungal decay and shall be registered for use as a wood preservative by the U. S. Environmental Protection Agency.
- D. Wood Requiring Treatment:
1. Lumber, Preservative Treated:
    - a. Nailers, blocking, stripping, and similar items in conjunction with roofing, flashing, and other construction.
    - b. Sills, blocking, furring, stripping, and similar items in contact with masonry or concrete.
  2. Lumber, Fire Retardant Treated:
    - a. Wood in concealed spaces.
    - b. Wood exposed within the roof/ceiling assembly.
  3. Interior Plywood, Fire Retardant Treated:
    - a. Plywood used as finish material, walls, wainscots, and bases in fire-rated corridors.
    - b. Plywood backing for electrical and telephone equipment.
  4. Plywood Not to be Fire Retardant Treated:
    - a. Exterior plywood used as non-structural sheathing, substrate, or parapet cap assembly.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas to receive rough carpentry work and verify following:
1. Installation of building components to receive rough carpentry work is complete.
  2. Surfaces are satisfactory to receive work.
  3. Spacing, direction and details of supports are correct to accommodate installation of blocking, backing, stripping, furring and nailing strips.

### 3.2 SITE TREATMENT OF WOOD MATERIALS

- A. Wood Treatment at Site: Comply with AWPAC M4 for applying field treatment to cut surfaces of preservative treated lumber.
  - 1. Use inorganic boron for items continuously protected from liquid water.
  - 2. Use copper naphthenate for items not continuously protected from liquid water.

### 3.3 INSTALLATION

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
  - 1. Construct members of continuous pieces of longest possible lengths.
  - 2. Do not splice structural members between supports, unless otherwise indicated.
- B. Provide blocking and framing indicated and necessary to support facing materials, fixtures, specialty items, and trim.
  - 1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.
- C. Secure members in place with specified fastener. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Do not countersink nail heads unless otherwise indicated.
- D. Wood Ground, Sleeper, Blocking, and Nailer: Install where indicated and where required for screeding or attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
  - 1. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.
  - 2. Recess heads of fasteners below surface of wood members.
- E. Wood Furring: Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.
- F. Fasteners: Install fasteners with manufacturer's recommended power tool for each type of fastener.

### 3.4 PROTECTION

- A. Protect rough carpentry from weather throughout construction period.

END OF SECTION 061000

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 061000 – ROUGH CARPENTRY

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the rough carpentry is installed and is in general conformance with the Contract Documents, applicable Codes, and shop drawings. The rough carpentry has been provided in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

ROUGH CARPENTRY INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_

## SECTION 064000 - ARCHITECTURAL WOODWORK

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section Includes:
  - 1. Plastic Laminate Casework.

## 1.2 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.
- B. American National Standards Institute (ANSI):
  - 1. ANSI A208.1 - Particleboard.
  - 2. ANSI A208.2 - Medium Density Fiberboard for Interior Use.
- C. Architectural Woodwork Institute (AWI) / Architectural Woodwork Manufacturers Association of Canada (AWMAC) / Woodwork Institute (WI) - Joint Publication:
  - 1. AWI/AWMAC/WI - Architectural Woodwork Standards.
- D. American Plywood Association (APA): APA - Grades & Specifications.
- E. National Electrical Manufacturer's Association (NEMA):
  - 1. NEMA LD3 - High-Pressure Decorative Laminates.

## 1.3 DELIVERY, STORAGE AND HANDLING

- A. Transport, handle, store, and protect products in compliance with the requirements of Section 016000.
- B. Inspect materials delivered and reject those not qualifying with requirements, those damaged in transit, or those that appear otherwise unsatisfactory.
- C. Schedule delivery of items to installation areas that are in proper condition to receive them. Place items neatly and systematically to avoid damage, store in clean, dry, enclosed, and secure storage area.

## 1.4 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install architectural woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

## PART 2 - PRODUCTS

## 2.1 LAMINATE MATERIALS

- A. High Pressure Laminate (HPL): NEMA LD3: Color, pattern, and finish as indicated in this Section. Exposed Horizontal and Vertical Surfaces: GP-50. Postformed Surfaces: PF-42. Provide HPL products as manufactured by the following as specified in the Color/Pattern Schedule below:
  - 1. Formica Corporation, Indianapolis, IN (800) 367-6422.
  - 2. Wilsonart, Temple, TX (800) 433-3222.

## 2.2 ACCESSORIES

- A. Adhesives: Low VOC adhesive, as recommended by laminate manufacturer and suitable for shop or field application.
  - 1. Toxicity / IEQ:
    - a. Comply with applicable regulations regarding toxic and hazardous materials.
    - b. Comply with Green Seal Standard GS-36 for commercial aerosol adhesives.
    - c. Comply with California's South Coast Air Quality Management District (SCAQMD) Rule No. 1168 in areas where exposure to freeze/thaw conditions and direct exposure to moisture will not occur. In areas where freeze/thaw conditions exist or direct exposure to moisture can occur, comply with California's Bay Area AQMD Regulation 8, Rule 51 for containers larger than 16 oz. and with California Air Resource Board (CARB) for containers 16 oz. or less.
  - 2. Provide one of the following products or equivalent as recommended by laminate manufacturer.
    - a. Wilsonart 3000 Adhesive Series. (Do not use for metallic surfaces)
    - b. Sta'-Put SP80, by ITW TACC, Rockland, MA (800) 502-6991.
    - c. Titebond Neoprene Plus, by Franklin International, Columbus, OH (614) 443-0241.
- B. Fasteners: Unless otherwise recommended by manufacturer, use size and type to suit application. Use galvanized or stainless for exterior and high humidity locations. Use plain finish at other locations.

## 2.3 PANEL PRODUCT

- A. Medium Density Fiberboard (MDF), ANSI A208.2, Grade MD, made with binder containing no urea formaldehyde resin.
- B. Particleboard, density 45 lb., ANSI A208.1, Grade M-2, made with binder containing no urea formaldehyde resin.
- C. Provide MDF or Particleboard specified above as manufactured by one of the following:
  - 1. Flakeboard Company, Bennettsville, SC (843) 479-3800.
  - 2. Homasote, West Trenton, NJ (800) 257-9491.
  - 3. Panel Source International, Edmonton, Alberta, Canada (877) 464-7246.
  - 4. Roseburg Forest Products, Roseburg, OR (800) 245-1115.
  - 5. Temple Inland, Memphis, TN (901) 419-9000.

## 2.4 COLOR/PATTERN SCHEDULE

- A. Provide one color where two or more are specified. Provide laminate specified below as applicable as shown or scheduled on the Drawings. All PL designations are for HPL unless otherwise indicated. Colors shown in parenthesis are generic color names.
  - 1. PL-1 (Light Gray):
    - a. No. 692 Folkstone Celesta, by Formica.
    - b. No. 4142-60 Grey Glace, by Wilsonart.
- B. Substitutions: Not permitted. Comply with the requirements of Section 016000.

## 2.5 PLASTIC LAMINATE CASEWORK

- A. Fabricate using following materials for listed surfaces as defined in AWI/AWMAC/WI - Architectural Woodwork Standards.
  - 1. Exterior Exposed Surfaces (desktops and sides): High pressure laminate as shown.

## PART 3 - EXECUTION

### 3.1 PLASTIC LAMINATE CASEWORK



- A. Install woodwork plumb, level, and straight without distortion; use concealed shims. Scribe and cut woodwork to fit adjoining work. Anchor woodwork items to nailers or blocking or directly to substrate using concealed fasteners.
- B. Desktops: Anchor plastic laminate countertops securely to base units.
- C. Interior of upper cabinets to be standard White Melamine.

END OF SECTION 064000

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 064000 – ARCHITECTURAL WOODWORK

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the architectural woodwork is installed and is in general conformance with the Contract Documents, applicable Codes, and shop drawings. The architectural woodwork has been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

ARCHITECTURAL WOODWORK INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (     ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (     ) \_\_\_\_\_

## SECTION 068316 - FIBERGLASS REINFORCED PANELING

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section Includes: FRP plastic coated panels and accessories.

## 1.2 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.
- B. ASTM International (ASTM):
  - 1. ASTM E 84 - Test Method for Surface Burning Characteristics of Building Materials.
  - 2. ASTM D 256 - Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics.
  - 3. ASTM D 638 - Test Method for Tensile Properties of Plastics.
  - 4. ASTM D 790 - Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics And Electrical Insulating Materials.

## PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

- A. Manufacturers:
  - 1. Crane Composites, Channahon, IL (800) 435-0080.
- B. Substitutions not allowed.

## 2.2 FIBERGLASS REINFORCED PANELING

- A. Fiberglass Reinforced Paneling:
  - 1. RF3: Varietex, by Crane Composites.
    - a. Texture: Satin Linen Texture.
    - b. Color: Vik #1276
- B. Substitutions: Not permitted.
- C. Description: Fiber reinforced plastic coated panels; 0.09 inch thick.
- D. Physical Characteristics: Meet the following minimum characteristics:
  - 1. Flexural Strength: 8,500 psi per ASTM D 790.
  - 2. Tensile Strength: 5,000 psi per ASTM D 638.
  - 3. Izod Impact Resistance: 4 ft-lb/sq. inch per ASTM D 256.
  - 4. Surface burning characteristics in accordance with ASTM E 84 for Class C finish:
    - a. Flame Spread: Less than 200.
    - b. Smoke Density: Less than 450.
- E. Wall Trim: Provide manufacturer's natural aluminum top cap at all wainscot/exposed top of panels. Install color matched caulk on all vertical seams.
- F. Adhesive: Manufacturer's Low VOC Latex-Based Construction Adhesive suitable for gypsum board substrate.
- G. Sealant: Manufacturer's Silicone Construction Sealant.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine surfaces and adjacent areas where products will be installed and verify that surfaces conform to product manufacturer's requirements for substrate conditions. Do not proceed until unsatisfactory conditions have been corrected.
- B. Beginning of installation indicates acceptance of substrate conditions.

### 3.2 PREPARATION

- A. Prepare substrate for product installation in accordance with manufacturer's published instructions.

### 3.3 INSTALLATION

- A. FRP Panels:
  - 1. Install FRP wall panels in accordance with manufacturer's published instructions.
  - 2. Pre-fit each wall panel before securing in place. Cut panels with carbide-tipped power saw or swivel-head shear.
  - 3. Provide manufacturer's recommended spacing between abutting panel ends, edges and trim. Provide minimum 1/8-inch space around pipes, electrical fittings, obstructions and other items penetrating panels. Fill joints with sealant.
  - 4. Install panels with edges vertical and plumb. Use maximum length pieces to provide minimum number of end joints.
    - a. Align panel to panel vertical joints at inside and outside corner conditions.
  - 5. Gypsum Board Substrate: Apply adhesive to gypsum board substrate and to panel backs as recommended by manufacturer with V-notch spreader. Provide 100 percent coverage of adhesive.
  - 6. Install accessory panel trim pieces concurrently with installation of panels. Miter cut accessory panel trim at corners to provide smooth transition. Set trim attached to adjacent panel ends and edges and seal with sealant.
  - 7. Install color matched caulk at all vertical seams.
  - 8. Seal corner seams, base and ceiling junctures, and junctures between panels and wall with sealant color matched to panels. Remove excess sealant during installation.
  - 9. Provide sealant around all openings, corners, and joints.

### 3.4 FIELD QUALITY CONTROL

- A. Inspect installation, accessories, and fastening to substrate.

END OF SECTION 068316

## SECTION 072100 – THERMAL INSULATION

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section Includes:
  - 1. Batt Insulation.
  - 2. Board Insulation.
- B. Related Requirements as required per Project Manual:
  - 1. Section 042200 – Concrete Unit Masonry: Masonry fill insulation.
  - 2. Section 092900 - Gypsum Board: Metal furring.

## 1.2 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.
- B. ASTM International (ASTM):
  - 1. ASTM E 84 - Test Method for Surface Burning Characteristics of Building Materials.
  - 2. ASTM C 578 - Rigid, Cellular Polystyrene Thermal Insulation.
  - 3. ASTM C 665 - Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
  - 4. ASTM C 1289 - Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
  - 5. ASTM E 136 - Behavior of Materials in a Vertical Tube furnace at 750 C.

## 1.3 DEFINITIONS

- A. Concealed Insulation: Insulation concealed within framing system, both faces protected by finish material.
- B. Exposed Insulation: Insulation exposed within framing system, one or both faces unprotected.

## 1.4 DELIVERY, STORAGE AND HANDLING

- A. Transport, handle, store, and protect products in compliance with the requirements of Section 016000 and manufacturer's recommendations.

## PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

- A. Provide products from the following manufacturers as specified in the Materials paragraph below.

## 2.2 REGULATORY REQUIREMENTS

- A. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84 for surface-burning characteristics and other methods specified. Identify materials with appropriate markings of applicable testing and inspecting agency.

## 2.3 MATERIALS

- A. Batt Insulation: ASTM C 665 mineral fiber blanket insulation.

## THERMAL INSULATION

1. Unfaced Glass Fiber: Type I (blankets without membrane facing); with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively passing ASTM E 136 for combustion characteristics.
  2. Faced, Glass-Fiber: Type III (blankets with reflective membrane facing), Class A (membrane-faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier), faced with vapor-retarder membrane on 1 face.
  3. Sound Attenuation Insulation (Sound Batts): Unfaced glass fiber batt insulation as specified above.
  4. Provide batt insulation by one of the following manufacturers:
    - a. CertainTeed Corporation.
    - b. Guardian Fiberglass, Inc.
    - c. Johns Manville.
    - d. Owens Corning.
- B. Board Insulation:
1. Extruded Polystyrene:
    - a. Type IV – Foundation Perimeter Insulation: ASTM C 578, Type IV (density 1.6 pcf minimum); square edges. Provide one of the following:
      - 1) Styrofoam Square Edge by Dow.
      - 2) Foamular 250 by Owens Corning.
      - 3) Greenguard CM or SL by Pactiv.
- C. Metal Building Insulation
1. Thermal Design Roof Simple Saver System. Provide system as needed to comply with energy code.
  2. Thermal Design Wall Simple Saver System. Provide system as needed to comply with energy code.
- D. Substitutions: Comply with the requirements of Section 016000.

## 2.4 ACCESSORIES

- A. Tape: Polyethylene or polyester self-adhering type; two inches wide.
- B. Adhesive: Waterproof type, acceptable to manufacturer of insulation board. Adhesive VOC shall be within the limits of not greater than 70 g/L in accordance with the California's South Coast Air Quality Management District (SCAQMD) Rule No. 1168.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Batt Insulation:
1. Verify adjacent materials are dry and ready to receive installation.
  2. Verify mechanical and electrical services within walls have been installed and tested.
- B. Board Insulation:
1. Verify substrate and adjacent materials and insulation boards are dry and ready to receive insulation and adhesive.
  2. Verify insulation boards are unbroken, free of damage.

### 3.2 INSTALLATION - BATT INSULATION

- A. Install batt insulation in accordance with manufacturer's instructions, without gaps or voids.

- B. Trim insulation neatly to fit spaces. Use batts free of damage. Fit insulation tight in spaces and tight to exterior side of mechanical and electrical services within the plane of insulation.
- C. Install insulation with factory applied membrane facing warm side in winter of building spaces. Lap ends and side flanges of membrane. Attach insulation in place to framing; tape seal butt ends and lapped side flanges. Tape seal tears or cuts in membrane.

### 3.3 INSTALLATION - BOARD INSULATION AT FOUNDATION PERIMETER

- A. Install minimum 24 inches of board insulation full height of foundation wall from top of footing to bottom of slab with remainder laid horizontally beneath the slab.
- B. Apply adhesive in three continuous beads to board insulation.
- C. Install boards on foundation wall or grade beam perimeter. Place boards by method to maximize contact bedding. Stagger joints. Butt edges and ends tight to adjacent board and to protrusions.
- D. Extend boards over expansion and control joints, unbonded to foundation two inches both sides of joint. Backfill carefully to prevent damage to insulation boards.

### 3.4 INSTALLATION - INSULATION AT FURRED-OUT MASONRY WALLS

- A. Apply insulation to interior of exterior CMU wall between furring strips where furring is indicated on Drawings.

### 3.5 INSTALLATION – METAL BUILDING INSULATION

- A. Comply with manufacturer instruction for installation.

### 3.6 SCHEDULES

- A. Provide insulation types as scheduled below and as indicated on Drawings.

CONDITION	TYPE OF INSULATION	THICKNESS
Exterior Wall	Faced Batt Insulation	3-1/2 inches (R=11) or 6 inches (R=19) or 8 inches (R=25) as shown; or as required to fill cavity.
Interior Partitions	Unfaced Batt Insulation	3-1/2 inches or 6 inches as shown.
Sound Attenuation	Unfaced Batt Insulation	3-1/2 inches or 6 inches as shown.

Foundation Perimeter Insulation	Extruded Polystyrene, Type IV	2.0 inches (R=10.0)
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END OF SECTION 072100

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 072100 – THERMAL INSULATION

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

## Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the thermal insulation is installed and is in general conformance with the Contract Documents, applicable Codes, and shop drawings. The thermal insulation has been provided in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

## THERMAL INSULATION INSTALLER:

\_\_\_\_\_  
(Subcontractor Signature)\_\_\_\_\_  
(Subcontractor name and address) Phone Number: (    ) \_\_\_\_\_

## CONTRACTOR:

\_\_\_\_\_  
(Contractor Signature)\_\_\_\_\_  
(Contractor name and address) Phone Number: (    ) \_\_\_\_\_



## SECTION 072419.10 - EXTERIOR INSULATION AND FINISH SYSTEM (EIFS) CORNICE

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section Includes:
  - 1. EIFS Cornice.

## 1.2 PREINSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference at Project site.

## 1.3 QUALITY ASSURANCE

- A. Installer Qualifications: An installer who is certified in writing by EIFS Manufacturer as qualified to install Manufacturer's system using trained workers.

## PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- B. Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - 1. BASF Wall Systems.
  - 2. Dryvit Systems, Inc.
  - 3. Parex USA, Inc.
  - 4. Sto Corp.

## 2.2 EIFS MATERIALS

- A. EIFS Cornice (Foam Shapes): Pre-Manufactured EIFS extrusion Expanded Polystyrene (EPS) Molded, rigid cellular polystyrene, complying with ASTM C 578, Type I; expanded polystyrene (EPS) complying with ASTM E 2430; as required by and in accordance with EIFS Manufacturer's requirements.
- B. Primer/Sealer: EIFS Manufacturer's standard substrate conditioner designed to protect substrates from moisture penetration and to improve the bond between substrate and insulation adhesive.
- C. Water-Resistive Coatings: EIFS Manufacturer's standard formulation and accessories for use as water-resistive barriers; compatible with substrate and complying with physical and performance criteria of ASTM E 2570.

- D. Flexible-Membrane Flashing: Cold-applied, self-adhering, self-healing, rubberized-asphalt and polyethylene-film composite sheet or tape and primer; EIFS Manufacturer's standard or product recommended in writing by EIFS Manufacturer.
- E. Insulation Adhesive: EIFS Manufacturer's standard formulation designed for indicated use.
- F. Reinforcing Mesh: Balanced, alkali-resistant, open-weave, glass-fiber mesh treated for compatibility with other EIFS materials, made from continuous multi-end strands with retained mesh tensile strength of not less than 120 lbf/in. according to ASTM E 2098.
- G. Base-Coat Materials: EIFS manufacturer's standard mixture.
- H. Waterproof Adhesive/Base-Coat Materials: EIFS Manufacturer's standard waterproof formulation.
- I. Primer: EIFS Manufacturer's standard factory-mixed, elastomeric-polymer primer for preparing base-coat surface for application of finish coat.
- J. Finish-Coat Materials: EIFS Manufacturer's standard acrylic-based coating.
  - 1. Colors: As indicated on Drawings.
- K. Trim Accessories: Type as designated or required to suit conditions indicated and to comply with EIFS Manufacturer's written instructions; manufactured from UV-stabilized PVC; and complying with ASTM D 1784, Manufacturer's standard cell class for use intended, and ASTM C 1063.

## PART 3 - EXECUTION

### 3.1 EIFS INSTALLATION

- A. Expansion Joints: Install at locations indicated and where required by EIFS Manufacturer.
- B. Waterproof Adhesive/Base Coat: To exposed surfaces of cornice, apply in minimum thickness recommended in writing by EIFS Manufacturer over cornice.
- C. Base Coat: Apply to exposed surfaces of cornice in minimum thickness recommended in writing by EIFS Manufacturer.
- D. Reinforcing Mesh: Embed reinforcing mesh in wet base coat to produce wrinkle-free installation with mesh continuous at corners, overlapped not less than 2-1/2 inches or otherwise treated at joints to comply with ASTM C 1397 and EIFS Manufacturer's written instructions. Do not lap reinforcing mesh within 8 inches of corners. Completely embed mesh, applying additional base-coat material if necessary, so reinforcing-mesh color and pattern are invisible.
- E. Double-Layer Reinforcing-Mesh Application: Where indicated or required, apply second base coat and second layer of reinforcing mesh, overlapped not less than 2-1/2 inches (64 mm) or otherwise treated at joints to comply with ASTM C 1397 and EIFS Manufacturer's written instructions in same manner as first application. Do not apply until first base coat has cured.
- F. Additional Reinforcing Mesh: Apply strip reinforcing mesh around openings, extending 4 inches beyond perimeter. Apply additional 9-by-12-inch strip reinforcing mesh diagonally at corners of openings (re-entrant corners). Apply 8-inch- wide, strip reinforcing mesh at both inside and

outside corners unless base layer of mesh is lapped not less than 4 inches on each side of corners.

- G. Foam Build-Outs: Fully embed reinforcing mesh in base coat.
- H. Double Base-Coat Application: Where indicated, apply second base coat in same manner and thickness as first application, except without reinforcing mesh. Do not apply until first base coat has cured.
- I. Primer: Apply over dry base coat according to EIFS Manufacturer's written instructions.
- J. Finish Coat: Apply over dry primed base coat, maintaining a wet edge at all times for uniform appearance, in thickness required by EIFS Manufacturer to produce a uniform finish of color and texture matching approved sample and free of cold joints, shadow lines, and texture variations.

END OF SECTION 072419.10

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 072419.10 – EIFS CORNICE

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the EIFS cornice is installed and is in general conformance with the Contract Documents, applicable Codes, and shop drawings. The EIFS cornice has been provided in accordance with the Manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

EIFS CORNICE INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address) Phone Number: (     ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address) Phone Number: (     ) \_\_\_\_\_

## SECTION 072419 - EXTERIOR INSULATION AND FINISH SYSTEM (EIFS) (NON FLORIDA)

## PART 1 GENERAL

## 1.1 SUMMARY

- A. Section Includes: Field applied exterior insulation and finish system (EIFS) applied over metal studs.
- B. Related Requirements:
  - 1. Section 055000 – Metal Fabrications.
  - 2. Section 079200 - Joint Sealers: Joint sealants used in conjunction with exterior insulation and finish system.

## 1.2 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.
- B. ASTM International (ASTM):
  - 1. ASTM C 578 - Rigid, Cellular Polystyrene Thermal Insulation.
  - 2. ASTM E 84 - Surface Burning Characteristics of Building Materials.
  - 3. ASTM D 1784 - Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.
  - 4. ASTM E 2430 - Expanded Polystyrene ("EPS") Thermal Insulation Boards For Use In Exterior Insulation and Finish Systems ("EIFS").
  - 5. ASTM E 2568 - PB Exterior Insulation and Finish Systems.
- C. National Fire Protection Association (NFPA):
  - 1. NFPA 268 - Standard Test Method For Determining Ignitability Of Exterior Wall Assemblies Using A Radiant Heat Energy Source.
  - 2. NFPA 259 - Standard Test Method For Potential Heat Of Building Materials.

## 1.3 PREINSTALLATION MEETING

- A. Convene Preinstallation Meeting at Site one week prior to commencing work of this Section.
- B. Attendance:
  - 1. Require attendance of parties directly affecting work of this Section, including, but not limited to the following:
    - a. Owner's Construction Manager.
    - b. General Contractor.
    - c. EIFS Subcontractor.
    - d. EIFS Manufacturer's Representative.
  - 2. Notify attendees at least two weeks prior to the conference.
- C. Agenda:
  - 1. Review preparation and installation procedures and coordinating and scheduling required with related work.
  - 2. Review foreseeable methods and procedures related to roofing work, including the following:
  - 3. Tour, inspect and discuss condition of substrate, penetrations and other preparatory work performed by other trades.
  - 4. Review EIFS system requirements (Drawings, Specifications and other Contract Documents including submittals).
  - 5. Review required submittals.
  - 6. Review and finalize construction schedule related to EIFS work and verify availability of materials, installer's personnel, equipment, and facilities needed to make progress and avoid delays.

7. Review required inspections, testing, and material usage accounting procedures.
8. Review weather and forecasted weather conditions, and procedures for coping with unfavorable conditions.

1.4 Documentation: Record discussions of conference and decisions and agreements reached and furnish copy of record to each party attending.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Comply with the requirements of Section 017700.
- B. Manufacturer's Observation Reports: Submit report signed by EIFS Manufacturer of observations during site visit by Manufacturer's representative.

#### 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Single firm, approved in writing by EIFS Manufacturer, employing trained workers familiar with current installation methods and materials. Installer shall have not less than 2 years documented experience in the installation of the specific system to be installed and on projects of same size and scope.
- B. Source Limitations: Obtain EIFS from single source from single EIFS Manufacturer and from sources approved by EIFS Manufacturer as compatible with system components.

### PART 2 PRODUCTS

#### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide EIFS by one of the following:
  1. BASF Wall Systems, Inc., Jacksonville, FL (Includes Senergy Products) (800) 221-9255. Contact: Steve DonFrancesco (770) 335-5260.
  2. Dryvit Systems, Inc., Warwick, RI, (800) 556-7752. Contact: Bob Dazel, AIA, Marketing manager for Strategic Accounts (734)276-0404.
  3. Omega Products International, Inc., Los Angeles, CA, (800) 600-6634

#### 2.2 PRODUCTS

- A. Products: Insulation board, Class PB EIFS System. Provide one of the following products:
  1. Senerflex Classic PB by BASF – Senergy.
  2. Outsulation Plus by Dryvit.
  3. Akroflex Barrier, Class PB by Omega.
- B. Substitutions: Comply with the requirements of Section 016000.

#### 2.3 PERFORMANCE REQUIREMENTS

- A. Bond Integrity: System shall be free from bond failure within EIFS components or between system and supporting wall construction, resulting from exposure to wind loads, weather, or other in-service conditions.
- B. Weathertightness: System shall be resistant to water penetration from exterior into interior of building that results in deterioration of thermal-insulating effectiveness or other degradation of EIFS and assemblies behind it, including substrates, supporting wall construction, and interior finish, and including a means that allows water entering into an EIFS assembly to drain to the exterior.

- C. Physical Properties, Structural Performance,: Comply with ICC-ES AC235 and ASTM E 2568.
- D. Fire-Test-Response Characteristics: Provide EIFS and system components with the following fire-test-response characteristics as determined by testing identical EIFS and system components per test method indicated below by UL or another testing and inspecting agency acceptable to Authorities Having Jurisdiction. Identify products with appropriate markings of applicable testing agency.
  - 1. Radiant Heat Exposure: No ignition of EIFS per NFPA 268.
  - 2. Potential Heat: Acceptable level per NFPA 259.
  - 3. Surface-Burning Characteristics: Insulation board, adhesives, base coats, and finish coats with flame-spread index of 25 or less and smoke-developed index of 450 or less, per ASTM E 84.
- E. Evaluation Report: The system proposed for use from the specified products shall have a current Evaluation Report (ICC-ER) by the International Code Council Evaluation Service (ICC-ES) showing compliance with the ICC Acceptance Criteria specified herein and the International Building Code or the model code within the jurisdiction of the project and as required by the Authority Having Jurisdiction.

## 2.4 MATERIALS

- A. General: Provide materials and EIFS components standard with the Manufacturer as applicable for the product systems listed and selected for the project.
- B. Compatibility: Provide adhesive, fasteners (as applicable), board insulation, reinforcing meshes, base-and finish-coat systems, sealants, and accessories that are compatible with one another and compliant with EIFS Manufacturer's printed instructions.
- C. Flashing: EIFS Manufacturer's standard or product recommended by EIFS Manufacturer.
- D. Insulation Adhesive: EIFS Manufacturer's standard formulation. Adhesive VOC shall be not greater than 50 g/L as set forth in the California's South Coast Air Quality Management District (SCAQMD) Rule No. 1168.
- E. Board Insulation: Molded, rigid cellular polystyrene, complying with ASTM C 578, Type I; expanded polystyrene (EPS) complying with ASTM E 2430; or polyisocyanurate; as required by and in accordance with EIFS Manufacturer's requirements.
  - 1. Board Insulation: EIFS Manufacturer's standard factory-fabricated profile. Minimum thickness: 1 1/2 inch.
  - 2. EIFS Cornice (Foam Shapes): Pre-Manufactured EIFS extrusion Expanded Polystyrene (EPS) as specified above for insulation and produced by the same Manufacturer as the EIFS system installed. Cut and form to profile as indicated on Drawings.
    - a. Adhesive: As recommended by the EIFS Manufacturer and compliant with EIFS Manufacturer's requirements.
- F. Reinforcing Mesh: Balanced, alkali-resistant, open-weave, glass-fiber mesh; complying with ASTM D 578 and the following:
  - 1. Standard-Impact Reinforcing Mesh: Not less than 4.0 oz./sq. yd.
  - 2. Heavy-Duty Reinforcing Mesh: Not less than 20 oz./sq. yd. .
  - 3. Strip Reinforcing Mesh: Not less than 3.75 oz./sq. yd.
  - 4. Detail Reinforcing Mesh: Not less than 4.0 oz./sq. yd.
  - 5. Corner Reinforcing Mesh: Not less than 7.2 oz./sq. yd.
- G. Base-Coat Materials: Manufacturer's standard formulation.
- H. Primer: Factory-mixed primer if and as recommended by Manufacturer.
- I. Finish-Coat Materials: EIFS Manufacturer's standard acrylic-based coating, factory-mixed formulation of polymer-emulsion binder, colorfast mineral pigments, sound stone particles, and fillers.
  - 1. Texture: Equivalent to Dryvit standard "Sandblast".

- J. Mechanical Fasteners (If required by Manufacturer): Corrosion-resistant fasteners consisting of thermal cap, standard washer and shaft attachments, and fastener suitable for substrate.
- K. Trim Accessories: Manufactured from UV-stabilized PVC and complying with ASTM D 1784 and ASTM C 1063.
- L. Joint Sealant: Joint sealant shall be as specified in Section 079200 unless otherwise required by the EIFS Manufacturer.

### 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 EIFS.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Begin coating application only after surfaces are dry.

#### 3.2 PREPARATION

- A. Protect contiguous work from moisture deterioration and soiling caused by application of EIFS. Provide temporary covering and other protection needed to prevent spattering of exterior finish coats on other work.
- B. Protect EIFS, substrates, and wall construction behind them from inclement weather during installation. Prevent penetration of moisture behind plane of EIFS and deterioration of substrates.
- C. Prepare and clean substrates to comply with EIFS Manufacturer's written instructions to obtain optimum bond between substrate and adhesive for insulation.

#### 3.3 INSTALLATION

- A. Comply with EIFS Manufacturer's written instructions for installation of EIFS as applicable to type of substrate indicated.
- B. Trim: Apply trim accessories at locations indicated on Drawings.
- C. Board Insulation: Attach to substrate.
- D. Expansion Joints: Install at locations indicated, where required by EIFS Manufacturer, where expansion joints or control joints are indicated in substrates behind EIFS; where EIFS adjoin dissimilar substrates, materials, and construction; and where wall height changes
  - 1. Do not exceed Manufacturer's maximum recommended area.
  - 2. Coordinate placement of additional joints with Owner's Construction Manager.
- E. Base Coat: Apply to exposed surfaces of insulation and foam shapes in minimum thickness recommended in writing by EIFS Manufacturer, but not less than 1/16-inch dry-coat thickness.
- F. Reinforcing Mesh:
  - 1. Place reinforcing mesh over insulation and secure in place with base coating.
  - 2. Completely embed mesh in wet base coat, applying additional base-coat material if necessary, so reinforcing-mesh color and pattern are not visible.
  - 3. Apply heavy weight mesh in conjunction with standard weight mesh in areas below 8 feet above ground level.



- G. Finish Coat: Apply over dry base coat, maintaining a wet edge at all times for uniform appearance, in thickness required by EIFS Manufacturer to produce a uniform finish of color and texture matching approved sample and free of cold joints, shadow lines, and texture variations.
- H. Form 3/4 inch rustication joints straight and true to line, as indicated on Drawings.

#### 3.4 JOINTS

- A. Install sealant at joints within system and where system abuts dissimilar materials. Apply joint sealant using sealant type, application method, and installation procedures in accordance with Manufacturer's recommendation and Section 079200 and the EIFS Manufacturers evaluation report.

#### 3.5 REPAIR OF DAMAGED OR NON-CONFORMING WORK

- A. Repair or correct installed work which is damaged during construction or is otherwise incomplete or not conforming to specification requirements. Repair and correction shall be in accordance with Manufacturer's written and published instructions.

#### 3.6 FIELD QUALITY CONTROL

- A. Field quality control shall be the responsibility of the Contractor in accordance with Section 014000. Except as specified as mandatory, field quality control testing and inspection shall be at the discretion of the Contractor as necessary to assure compliance with Contract requirements.
- B. Manufacturer Services: A representative of the Manufacturer shall visit the site prior to installation of EIFS, during installation, and upon completion of installation of EIFS to become familiar with material and methods being applied. Site visits shall be coordinated 2 weeks in advance and include observation of substrate, installation, and verification of proper procedure to the extent observed. Manufacturer's Representative shall prepare observation report stating conformance or deficiencies noted.

END OF SECTION 072419

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 072419 - EXTERIOR INSULATION AND FINISH SYSTEM

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the exterior insulation and finish system is installed and is in general conformance with the Contract Documents, applicable Codes, and shop drawings. The exterior insulation and finish system has been provided in accordance with the Manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

EXTERIOR INSULATION AND FINISH SYSTEM INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address) Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address) Phone Number: (    ) \_\_\_\_\_

## SECTION 075323 – EPDM ROOFING

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section Includes:
  - 1. EPDM Membrane Roofing System.
- B. Related Requirements:
  - 1. Section 017700 – Closeout Procedures: Roofing warranty.
  - 2. Section 061000 - Rough Carpentry: Wood blocking and nailers.
  - 3. Section 076000 – Flashing and Sheet Metal: Sheet metal counter flashings, and other sheet metal.
  - 4. Section 077100 –Roof Specialties: Interface of gutters with roofing and metal flashings.
  - 5. Section 079200 - Joint Sealants.

## 1.2 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.
- B. ASTM International (ASTM):
  - 1. ASTM D 4637 – Standard Specification for EPDM sheet used in Single Ply Roof Membrane.
- C. Underwriters Laboratories, Inc. (UL):
  - 1. UL - Roofing Materials and Systems Directory.

## 1.3 SUBMITTALS

- A. Comply with the requirements of Section 013300. Submit required submittals within 30 days after contract award. Submittals shall be available at all times to the Owner's Representative.
- B. Shop Drawings: Submit Shop Drawings showing:
  - 1. Details required for completion but not shown on Drawings.
  - 2. Techniques for nighttime or weather tie offs.
- C. Closeout Submittals: Comply with the requirements of Section 017800.
  - 1. Roofing System Warranty.

## 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Transport, handle, store, and protect products in compliance with the requirements of Section 016000 and Manufacturer's recommendations.
- B. Deliver materials in Manufacturer's original unopened containers, dry and undamaged with seals and labels intact.
- C. Store materials in weather-protected environment, clear of ground and moisture. Storage requirements for insulation are as follows:
  - 1. Cover with tarpaulin, shield from moistures and ultraviolet rays.
  - 2. Elevate minimum of 4 inches above substrate.
  - 3. Secure to resist high winds.
  - 4. Distribute insulation stored on roof deck to prevent concentrated loads.
  - 5. Do not install wet insulation. Insulation shall be thoroughly dry prior to installation.

- D. Store cements, primers, and caulks in heated area above 40 degrees F during cold weather and in area below 80 degrees F in warm weather.
- E. Do not store materials on completed roofing.

## 1.5 PROJECT CONDITIONS

- A. Follow industry standards for environment requirements including, but not limited to, the following:
  - 1. Do not apply roofing membrane during inclement weather. When air temperature is expected to fall below 40 degrees F, follow specified Cold Weather Application Procedures as specified herein.
  - 2. Do not apply finished roofing system to wet, damp or frozen deck surface or when precipitation is occurring.
  - 3. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed during same day.
  - 4. Maintain bonding adhesive at a min of 60 degrees prior to application.

## 1.6 WARRANTY

- A. Provide Warranty commencing at date of Grand Opening, that includes cost of labor and materials for loss of weather tightness without financial limit for a period of 30 years.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements and to the extent specified hereinafter, provide products by the following Manufacturers:
  - 1. Firestone Building Products Company, Indianapolis, IN.
  - 2. Substitutions allowed per Architect/Owner review and approval.

### 2.2 SYSTEM DESCRIPTION

- A. Single Ply Membrane Roofing System: Single ply membrane roofing system (EPDM).
- B. Flashing and Waterproofing Membranes: Reinforced membrane and unreinforced, fully adhered, as defined herein and indicated on Drawings.

### 2.3 ROOFING SYSTEMS

- A. Single Ply adhered Black EPDM Membrane Roofing System. Subject to compliance with requirements, provide one of the following products:
  - 1. Rubbergard EPDM Roofing System by Firestone.
- B. Substitutions: Comply with the requirements of Section 016000.

### 2.4 ROOF MEMBRANE

- A. Roofing and Flashing Membrane: Black cured synthetic single-ply membrane composed of ethylene propylene diene terpolymer (EPDM) with the following properties:
  - 1. Reinforcement: None; membrane complying with ASTM D 4637 Type I.
  - 2. Thickness: 0.090 inch (2.2 mm).
  - 3. Nominal Thickness Tolerance: Plus/minus 10 percent.
  - 4. Sheet Width: Provide the widest available sheets to minimize field seaming.
- B. Flashing Membrane: Self-curing, non-reinforced membrane composed of nonvulcanized EPDM rubber, complying with ASTM D 4811 Type II, and with the following properties:

1. Thickness: 0.055 inch (1.4 mm).

## 2.5 ROOF PENETRATION FLASHING AND SEALS

- A. Urethane Rubber Seal System: Manufacturer's standard elastomeric pourable sealer pockets including two-part pourable urethane sealer.

## 2.6 ACCESSORIES

- A. Provide accessories as shown on the drawings and Manufacturer's system accessories for a complete and warranted Roofing System, including, but not limited to, the following:
  1. Weathered Membrane Cleaner.
  2. Lap Sealant.
  3. Bonding Adhesive.
  4. Membrane Fasteners.
  5. Termination Bar.
  6. Preformed Corner Patching.
  7. Draw Bands.
  8. Pressure-sensitive Flashing.
  9. Primer.
  10. In-seam Plates.
  11. Splice Tape.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify gutter is clean and smooth, free of depressions, waves, or projections, properly sloped to drains, valleys, and eaves. Defects in the substrate surface shall be reported and documented.
- B. Verify gutter surfaces are dry and free of water, snow, and ice.

### 3.2 PREPARATION

- A. Provide covers and other means of protection as necessary to protect building surfaces against damage during roofing work.

### 3.3 INSTALLATION

- A. Comply with membrane roofing system Manufacturer's written instructions for installing system.

### 3.4 ROOF MEMBRANE INSTALLATION

- A. Adhered Membrane:
  1. Unroll membrane over prepared substrate, lapping adjoining sheets as recommended by Manufacturer.
  2. Lay out the membrane pieces so that field and flashing splices are installed to shed water.
  3. Install membrane without wrinkles and without gaps or fishmouths in seams, bond and test seams and laps in accordance with membrane Manufacturer's instructions and details.
  4. Install membrane adhered to the substrate, with edge securement as specified.
  5. Adhered Membrane: Bond membrane sheet to substrate using membrane Manufacturer's recommended bonding material, application rate, and procedures.
    - a. Edge Securement: Secure membrane at all locations where membrane terminates or goes through an angle change greater than 2 in 12 inches (1:6) using mechanically fastened reinforced perimeter fastening strips, plates, or metal edging as indicated or as recommended by roofing Manufacturer.

- B. Cold Weather Application Procedures: When air temperature is expected to fall below 40 degrees F, follow Cold Weather Application Procedures as follows:
  - 1. Store materials in heated storage units prior to installation. Rotate adhesive, cement, and sealant containers to maintain their temperature above 40 degrees F.
  - 2. Allow membrane to relax until no wrinkles are visible.
  - 3. Allow adequate time for solvents in cements to flash off. Check dryness of applied cements before sealing joints.
  - 4. Verify that frost, dew, and other forms of moisture have evaporated prior to covering insulation with membrane to prevent entrapment of moisture within finished roof system.

### 3.5 WATER CUTOFFS AND WEATHER PROTECTION

- A. Install water cut-offs at end of day's operation to seal edge of roof membrane from moisture entry. If inclement weather appears imminent during roofing application, cease operations and protect deck, insulation, flashings, penetrations and membrane from moisture infiltration with water cutoffs. Insulation and roofing materials not so protected prior to inclement weather will be considered damaged and will be cause for rejection.
- B. Remove water cut-offs and other temporary weather protections prior to continuing roofing work. Remove materials that have been subject to moisture damage and return deck to a clean, dry condition before proceeding with roofing operations. Remove damaged materials from job site.
- C. The water cut-offs and weather protection shall not be considered a part of the final roof system specified.

### 3.6 FLASHING MEMBRANE AND ACCESSORIES INSTALLATION

- A. Install flashings, including laps, splices, joints, bonding, adhesion, and attachment, as required by membrane Manufacturer's recommendations and details.
- B. Metal Accessories: Install metal edgings, gravel stops, and copings in locations indicated on the drawings, with horizontal leg of edge member over membrane and flashing over metal onto membrane.
  - 1. Follow roofing Manufacturer's instructions.
  - 2. Remove protective plastic surface film immediately before installation
  - 3. Install water block sealant under the membrane anchorage leg.
  - 4. Flash with Manufacturer's recommended flashing sheet unless otherwise indicated.
- C. Scuppers: Set in sealant and secure to structure; flash as recommended by Manufacturer.
- D. Flashing at Walls, Other Vertical and Sloped Surfaces: Install weathertight flashing at all gutter edges and vertical surfaces that the roofing membrane abuts to; extend flashing at least 8 inches (200 mm) high above membrane surface.

### 3.7 INTERFACE WITH OTHER WORK

- A. Coordinate Work with installation of associated roof edge fascia system specified under other sections as the Work of this Section proceeds.
- B. Complete installation of base flashing at roof curbs prior to setting roof top equipment.

### 3.8 CLEANING

- A. Replace defaced or disfigured finishes caused by Work of this Section.
- B. One week prior to Grand Opening, sweep entire roof surface with a magnetic sweeper to remove nails, screws and other metal items which may cause subsequent damage to the roof.

### 3.9 MAINTENANCE AND REPAIR DURING CONSTRUCTION

- A. Maintain roofing system and related work from time of roofing completion until store Grand Opening. Repair material or installation defects or damage resulting from any subsequent work on the roof or from any weather-related damage. Maintain roof system in watertight condition including repair of conditions that show signs of inferior workmanship that may result in potential leaks. Repair leaks occurring prior to Grand Opening in accordance with good roofing practice and the requirements specified herein. Remove and replace wet insulation caused by water leaks and repair the roofing system.

END OF SECTION 075323

**ROOFING SYSTEM WARRANTY**

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

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

Type and Name of Building: \_\_\_\_\_

Location: \_\_\_\_\_

Roofing System Specification Number: \_\_\_\_\_ Area of Roof System: \_\_\_\_\_

Date of Store Grand Opening: \_\_\_\_\_ Date Warranty Expires: \_\_\_\_\_

Manufacturer's 24 hour Emergency Telephone: (\_\_\_\_) \_\_\_\_\_ (no answering machines or message Center)

Contact Name: \_\_\_\_\_

Contractor's Telephone: (\_\_\_\_\_) \_\_\_\_\_ (no answering machines or message center)

Contact Name: \_\_\_\_\_

Upon completion of and after inspection by the Manufacturer of such Work, Manufacturer agrees to warrantee the aforesaid Roofing System for a limited period and subject to the conditions herein set forth:

Manufacturer Warrantees, subject to the conditions herein set forth, that during a period of 30 years from the date of store Opening, it will, at its own cost and expense, make or cause to be made such repairs to said Roofing System resulting solely from faults or defects in materials and/or workmanship applied by or through the Roofing System Contractor as may be necessary to maintain said Roofing system in watertight condition. Owner's remedies and Manufacturer's liability shall include cost of labor and materials for loss of weather tightness without financial limit. In accordance with good roofing practice, the Manufacturer shall remove and replace all wet insulation (as defined in specifications) caused by water leaks covered under this Warranty (i.e. leaks resulting from circumstances other than those listed in the exclusions) and repair the Roofing System at no cost to the Owner. Should the investigation reveal that the leak is the result of something other than a defect in materials and/or workmanship applied by or through the Roofing System Contractor, the reasonable investigative work and reasonable repair costs shall be paid by the Owner. Failure by the Owner to pay these costs shall render this warranty null and void.

Warranty shall include materials and workmanship from the following items:

1. Membranes (including parapet waterproofing).
2. Membrane flashings including attachment to sheet metal flashings and trim.
3. Fasteners, cements, and adhesives.

This warranty is made subject to the following conditions:

1. The Owner shall notify Manufacturer within 24 hours of notice by the Owner's Roof Maintenance Department of leaks. The Manufacturer will respond with service within 24 hours of notice from owner (if not possible, than no later than 48 hours, however Owner retains the right to make repairs at Warrantor's expense to mitigate damages).
2. Specifically excluded from this Warranty is any and all damage to said roof system, the building, or contents caused by natural disasters, including, but not limited to: earthquake, hail, lightning, hurricane, tornado, strong gale wind force (72 MPH or greater), or structural failure of the building or of the roof deck (as defined by a licensed Structural Engineer and except that caused by the Manufacturer), fire, and acts of war. If the roof system is damaged by reason of any of the foregoing, this warranty shall become null and void (AFFECTED AREAS ONLY) for the balance of the warranty period unless such damage is repaired at the expense of the owner.



3. Manufacturer is not liable for consequential damages to the building or contents resulting from any defects in said roof system, including, but without limitation, any interruption of business experienced by Owner or occupants of the building.
4. All additions and/or alterations to the roof system shall be installed in accordance with the Manufacturer's written recommendations and the Manufacturer should provide prior to acceptance to said additions or alterations. Should unauthorized additions/alterations be discovered by the Owner's Roof Maintenance Department, the Manufacturer will be notified in writing within fourteen days of such discovery. Provide at Manufacturer's discretion an inspection of the unauthorized additions/alterations and notify the Owner in writing of any remedy required by the Manufacturer within fourteen days. This Installation/Inspection by the Manufacturer is to be done at a cost to Owner of not more than \$500.00 to cover travel and time for the inspector. Provide inspection of said roof during business hours. Failure to notify the Owner of any required remedy shall deem the addition/alteration acceptable to the Manufacturer and the warranty will remain in effect.
4. All additions and/or alterations to the roof system shall be installed in accordance with the Manufacturer's written recommendations and the Manufacturer should provide prior to acceptance to said additions or alterations. Should unauthorized additions/alterations be discovered by the Owner's Roof Maintenance Department, the Manufacturer will be notified in writing within fourteen days of such discovery. Provide at Manufacturer's discretion an inspection of the unauthorized additions/alterations and notify the Owner in writing of any remedy required by the Manufacturer within fourteen days. This Installation/Inspection by the Manufacturer is to be done at a cost to Owner of not more than \$500.00 to cover travel and time for the inspector. Provide inspection of said roof during business hours. Failure to notify the Owner of any required remedy shall deem the addition/alteration acceptable to the Manufacturer and the warranty will remain in effect.
5. The area of additions and/or alterations shall be the only area of the roof system where warranty is suspended. All other roof system areas will have continual coverage under the roof warranty.
6. This Warranty is transferable within the 20-year warranty period, subject to Manufacturer's inspection, written approval and transfer fee payment.
7. During the term of this warranty, the Manufacturer, its agents and employees, shall have free and unlimited access to the roof during the hours of store operation.
8. The terms and conditions of this warranty are controlling. Any other warranty conditions attached or referenced that are in conflict with this warranty are ineffective and invalid.
9. This limited warranty shall be governed and construed in accordance with the laws of the State of Arkansas without regard to conflict of laws.
10. The Manufacturer does not warrant products incorporated or utilized in this installation that it has not furnished. The Manufacturer specifically disclaims liability under any theory of law arising out of the installation or performance of, or damages sustained by or caused by, products not furnished by the Manufacturer.

IN WITNESS WHEREOF, this instrument has been duly executed this \_\_\_\_ day of \_\_\_\_\_,  
\_\_\_\_\_.

\_\_\_\_\_  
By \_\_\_\_\_

END OF WARRANTY

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 075323  
EPDM ROOFING

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City)

\_\_\_\_\_  
(State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Regulatory Requirements for Roof Assembly: The roof assembly meets the following FM & UL requirements:

- ☐ Roof assembly meets Class 1A-90 requirements for fire resistance and wind uplift in accordance with FM Approvals Standard 4470 and FM Global Loss Prevention Data Sheet 1-28 and FM Global Loss Prevention Data Sheet 1-29 (Insert UL Classification)

The following product has been selected for use in this project from the list of acceptable products specified.

Quality Assurance: Roofing Applicator: In accordance with this specification, the applicator is qualified to install the indicated Roofing System.

- ☐ Firestone Building Products Approved Roofing Contractor

Roofing System Manufacturer: Indicate System provided below:

- ☐ Rubbergard Roofing System, by Firestone

Roofing System Accessories: The following accessories are compatible with the indicated Roofing System Warranty.

- ☐ Sheet Seaming System:
- ☐ Cleaner: \_\_\_\_\_
  - ☐ Primer: \_\_\_\_\_
  - ☐ Lap Sealant: \_\_\_\_\_
- ☐ Bonding Adhesive: \_\_\_\_\_
- ☐ Mechanical Fasteners for Membrane:
- ☐ Manufacturer: \_\_\_\_\_
  - ☐ Termination Bar:
    - ☐ Manufacturer: \_\_\_\_\_
    - ☐ Manufacturer: \_\_\_\_\_
- ☐ Draw Band: Stainless steel.

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the Product identified above by Manufacturer's name and model number is (one of) the product(s) specified and is suitable for the intended use as defined within the Contract Documents and has been provided and placed in operational condition in accordance with the Manufacturer's published instructions and the Contract Documents.

SUPPLIER:

\_\_\_\_\_  
(Contact name of supplier offering above product)

Phone Number: (     ) \_\_\_\_\_

\_\_\_\_\_  
(Supplier name and address)

SUBCONTRACTOR:

\_\_\_\_\_  
(Contact name of subcontractor offering above product)

Phone Number: (     ) \_\_\_\_\_

\_\_\_\_\_  
(Subcontractor name and address)

CONTRACTOR:

\_\_\_\_\_  
(Contact name of Contractor)

\_\_\_\_\_  
(Contractor Signature and Title of Signatory)



## SECTION 076000 - FLASHING AND SHEET METAL

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section Includes:
  - 1. Roof edge trim and flashing.
- B. Related Requirements as required per Project Manual:
  - 1. Section 042200 – Concrete Unit Masonry: Metal reglets and through-wall flashing for masonry.
  - 2. Section 061000 - Rough Carpentry: Wood blocking and nailers.
  - 3. Section 075423 – Thermoplastic-Polyolefin Roofing: Roof penetration flashing and seals.
  - 4. Section 077100 – Roof specialties: Scuppers and downspouts and manufactured roof edge fascia system.
  - 5. Section 079200 - Joint Sealants.
  - 6. Section 099000 - Painting and Coating.

## 1.2 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.
- B. American Architectural Manufacturer's Association (AAMA):
  - 1. AAMA 621 - Voluntary Specifications for High Performance Organic Coatings on Coil Coated Architectural Hot Dipped Galvanized (HDG) and Zinc-Aluminum Coated Steel Substrates.
- C. ASTM International (ASTM):
  - 1. ASTM A 653 - Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
  - 2. ASTM A 755/A - Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products.
  - 3. ASTM A 792/A - Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process
  - 4. ASTM B 749 - Lead and Lead Alloy Strip, Sheet, and Plate Products
  - 5. ASTM D 523 - Standard Test Method for Specular Gloss
- D. National Roofing Contractors Association (NRCA):
  - 1. NRCA - Low Slope Roofing Manual.
- E. Sheet Metal and Air Conditioning Contractors National Association (SMACNA):
  - 1. SMACNA - Architectural Sheet Metal Manual, Fifth Edition, 1993.

## 1.3 QUALITY ASSURANCE

- A. Perform work in accordance with SMACNA "Architectural Sheet Metal Manual" and NRCA "Low Slope Roofing Manual" standard details and requirements.
- B. Supplier Certification: Provide certification from galvanized sheet steel supplier stating that materials conform to ATSM A 653, G90 hot-dipped galvanized steel.

## 1.4 DELIVERY, STORAGE AND HANDLING

- A. Stack preformed material to prevent twisting, bending, or abrasion, and to provide ventilation.
- B. Prevent contact with materials during storage that may cause discoloration, staining, or damage.

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

- A. Galvanized Steel: ASTM A 653 Commercial Quality and Lock-Forming Quality, G90 coating designation hot-dip galvanized, mill phosphatized for painting where exposed to view from ground level. Sheet metal gages shall be as shown or as follows where not shown:
  - 1. Flashing and Counter Flashing: 24 gage.
  - 2. Edge Trim: 24 gage.

**2.2 ACCESSORIES**

- A. Fasteners: Galvanized steel finish exposed fasteners to match flashing metal. Furnish exposed fasteners with soft EPDM washers as manufactured by the following:
  - 1. Kwik-Pro Screws, by Hilti.
  - 2. Trugrip GT, by ITW Buildex.
- B. Sealant: Specified in Section 079200.
- C. Sealing Mastic: Single component gun grade butyl or polyurethane sealant as recommended by roofing Manufacturer.
- D. Draw Band: Stainless steel.

**2.3 FABRICATION**

- A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- B. Fabricate cleats of same material as sheet, interlockable with sheet.
- C. Form pieces in longest possible lengths.
- D. Hem exposed edges on underside 1/2 inch; miter and seam corners.
- E. Fabricate corners to form one piece with minimum 18 inches long legs; rivet for rigidity.
- F. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.
- G. Fabricate flashings to allow toe to extend 4 inches over roofing. Return and brake edges.
- H. Fabricate exposed sheet metal components with provisions for thermal expansion.

**2.4 FINISH**

- A. Sheet metal finish shall be as shown on Drawings.
- B. Where paint finish is shown, field paint in accordance with Section 099000.
- C. Paint metal surfaces exposed to view from ground level in accordance with Section 099000, and as indicated on Drawings, unless otherwise shown to be prefinished.
- D. Sheet metal surfaces not designated or specified to receive a finish shall remain uncoated.

**PART 3 - EXECUTION****3.1 INSPECTION****FLASHING AND SHEET METAL**

- A. Verify roof openings, curbs, pipes, sleeves, ducts, or vents through roof are solidly set.
- B. Verify roofing membrane termination and base flashings are in place, sealed, and secure.
- C. Beginning of installation means acceptance of existing conditions.

### 3.2 PREPARATION

- A. Field measure site conditions prior to fabricating work.
- B. Install starter and edge strips, and cleats before starting installation.

### 3.3 INSTALLATION

- A. Install sheet metal flashing and trim in accordance with applicable details of SMACNA "Architectural Sheet Metal Manual" and NRCA "Low Slope Roofing Manual." Anchor units of work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level. Install work with laps, joints, and seams that will be permanently watertight and weatherproof.
- B. Bed flanges of metal flashings in plastic cement or sealing mastic where required for waterproof performance.
- C. Apply bituminous coating on surfaces in contact with dissimilar materials including the following:
  - 1. Dissimilar metals as defined in SMACNA Appendix A-3.
  - 2. Preservative treated wood.
- D. Roof Edge Trim:
  - 1. Install sheet metal edge trim in accordance with SMACNA Figure 2-1, profile as indicated on Drawings. Nail edge trim flange at 3 inches on center, in staggered pattern.
  - 2. Thermal Expansion Joints: Install roof edge trim in 10 foot lengths with a 1/4 inch gap joint with a 6 inch cover plate in accordance with SMACNA Figure 2-5A. Set the cover plate in sealant, nail through opening in edge trim, and loose lock to the drip edge.
  - 3. Corner Joints: Notch and lap. Set laps in sealant and rivet for rigidity. Space rivets at 1 inch on center.
- E. TPO Coated Metal: Install TPO coated metal flashing and trim in accordance with Manufacturer's requirements and instructions. When used, TPO peel and stick strip edging may be eliminated by welding membrane directly to the TPO coated metal as allowed and recommended by the Manufacturer of the roofing system installed.

END OF SECTION 076000

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 076000 – FLASHING AND SHEET METAL

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the flashing and sheet metal is installed and is in general conformance with the Contract Documents, applicable Codes, and shop drawings. The flashing and sheet metal has been provided and placed in operational condition in accordance with the Manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

FLASHING AND SHEET METAL INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_



## SECTION 077100 – ROOF SPECIALTIES

## 1.1 SUMMARY

- A. Section Includes:
  - 1. Downspouts, with expansion joints.
  - 2. Downspout collectors.
  - 3. Scuppers.
  - 4. Conductor heads.
- B. Related Requirements as required per Project Manual:
  - 1. Section 061000 - Rough Carpentry: Wood blocking and nailers.
  - 2. Section 075423 –Thermoplastic-Polyolefin Roofing: Roof substrate.
  - 3. Section 076000 – Flashing and Sheet Metal.
  - 4. Section 079200 - Joint Sealants.
  - 5. Section 099000 - Painting and Coating: Field painting of metal surfaces.

## 1.2 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.
- B. American Architectural Manufacturer's Association (AAMA):
  - 1. AAMA 621 - High Performance Organic Coatings on Coil Coated Architectural Hot Dipped Galvanized (HDG) & Zinc-Aluminum Coated Steel Substrates
- C. American National Standards Institute / Single Ply Roofing Industry (ANSI/SPRI):
  - 1. ANSI/SPRI/FM 4435 ES-1 – Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems.
- D. ASTM International (ASTM):
  - 1. ASTM A 153 – Zinc Coating (Hot-Dip) on iron and Steel Hardware.
  - 2. ASTM A 653 - Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
  - 3. ASTM A 792 - Steel Sheet, 55 % Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
  - 4. ASTM C920 – Elastomeric Joint Sealants.
  - 5. ASTM F2329 – Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners.
- E. Sheet Metal and Air Conditioning Contractors National Association (SMACNA):
  - 1. Architectural Sheet Metal Manual.
- F. Steel Structures Painting Council (SSPC):
  - 1. SSPC - Paint 12 - Cold-Applied Asphalt Mastic (Extra Thick Film).

## 1.3 PERFORMANCE REQUIREMENTS

- A. SPRI Wind Design Standard: Manufacture and install copings tested according to SPRI ES-1 and capable of resisting the following design pressures:
  - 1. Design Pressure: As indicated on Drawings.

## 1.4 QUALITY ASSURANCE

- A. Nominal sizing of components for rainfall intensity determined by a storm occurrence of 1 in 5 years shall be as indicated on Drawings.

## 1.5 DELIVERY, STORAGE AND HANDLING

- A. Stack preformed materials to prevent twisting, bending, or abrasion, and to aid ventilation. Slope to drain.
- B. Prevent contact with materials during storage which may cause discoloration, staining, or damage.
- C. Transport, handle, store, and protect products in compliance with the requirements of Section 016000 and Manufacturer's recommendations.
- D. Deliver materials in Manufacturer's original unopened containers, dry and undamaged with seals and labels intact.
- E. Store cements, primers, and caulks in heated area above 40 degrees F during cold weather and in area below 80 degrees F in warm weather.
- F. Do not store materials on completed roofing.

## PART 2 - PRODUCTS

### 1.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements and to the extent specified hereinafter, provide products by the following Manufacturers:
  - 1. Firestone Building Products Company, Indianapolis, IN (800) 428-4442.
- B. Substitutions: Reference Section 016000.

### 2.2 MATERIALS

- A. Galvanized Steel Sheet: ASTM A 653 Structural Quality, Grade 33, G90 zinc coating, mill phosphatized for painting where exposed to view from ground level. Sheet metal components shall be galvanized steel sheet unless otherwise specified.
- B. Option: In lieu of galvanized steel sheet specified above, the following may be provided for through-wall scuppers at the option of the Contractor.
  - 1. Thermoplastic (TPO) Coated Sheet Metal; ASTM A 653, Type B Commercial Steel, 24 gage, G90 zinc coating, with a layer of .035 inch min non-reinforced membrane flashing. Color shall match TPO roof color. Product shall be UltraPly TPO Coated Metal, by Firestone.

### 2.3 SCUPPER AND DOWNSPOUT COMPONENTS

- A. Downspouts: 22 gauge, SMACNA rectangular unless otherwise indicated. Fabricate downspouts complete with mitered elbows. Downspouts shall be fully enclosed profile, SMACNA Figure 1-32B:
- B. Conductor Head: SMACNA Figure 1-25F.
- C. Through-Wall Scuppers: SMACNA Figure 1-26.
- D. Overflow Scuppers: SMACNA Figure 1-30.

### 2.4 ROOF EDGE COPING

- A. Coping System: 24 gage steel, with Kynar finish. Metal coping cap with galvanized steel anchor/support cleats for capping any parapet wall. The system shall be watertight, maintenance free, and does not

require exposed fasteners. Joints shall be a butt type with concealed splice plates. Standard model is (PTCF) for all sizes. Subject to compliance with requirements, provide one of the following products:

1. Coping – Tapered Version, by Firestone Building Products.
2. Substitutions not allowed.

- B. Finish: Smooth finish with factory finished baked-on fluoropolymer 2-coat coating system.
- a. Manufacturer's standard 2-Coat Fluoropolymer conforming to AAMA 621. Fluoropolymer finish containing not less than 70 percent Kynar 500 PVDF resin by weight in color coat with a minimum of 0.9 mil dry film thickness. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
  - b. Unexposed side finish shall consist of not less than a 0.5 mil dry film thickness backer coat.
  - c. Color: To match adjacent building wall, with closest standard manufacturer color.
- C. Miters: Fabricated by the manufacturer.

## 2.5 ACCESSORIES

- A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items included in metal edge kit or required by Manufacturer for a complete installation.
- B. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to meet performance requirements. Furnish the following unless otherwise indicated:
1. Exposed Penetrating Fasteners: Gasketed screws with hex washer heads matching color of sheet metal.
  2. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM A 153 or ASTM F 2329.
- C. Elastomeric Sealant: ASTM C 920, elastomeric polymer sealant of type, grade, class, and use classifications required by roofing-specialty Manufacturer for each application.
- D. Downspout Straps: Match downspout material, minimum 20 gauge, SMACNA Figure 1-35G.
- E. Bituminous Coating: SSPC - Paint 12, solvent-type bituminous mastic, nominally free of sulfur, compounded for 15 mil dry film thickness per coat.
- F. Sealant: Specified in Section 079200.
- G. Splash Blocks: Precast concrete units, minimum 3000 psi at 28 days, with 5 percent air entrainment, size and profile to suit application.
- H. Downspout Collectors: Pipe material, sizes, connections, dimensions and profiles to suit downspouts and underground storm drainage system as indicated on drawings.

## 2.6 FABRICATION

- A. Form downspouts of size as indicated on Drawings.
- B. Form scuppers of size indicated on Drawings.
- C. Fabricate in accordance with SMACNA details unless otherwise shown.
- D. Field measure site conditions prior to fabricating work.
- E. Form sections square, true, and accurate in size, in maximum possible lengths and free of distortion or defects detrimental to appearance or performance. Allow for expansion at joints.

- F. Hem exposed edges of metal.
- G. Field Finishing: Field paint downspouts and accessories surfaces exposed to view from ground surface unless noted as prefinished or unpainted on Drawings. Paint in accordance with Section 099000.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Verify that surfaces are ready to receive work and conditions are acceptable.
- B. Verify surfaces behind downspouts are painted prior to installation. Downspouts and conductor heads shall not be in place while surfaces behind such items are being painted.

#### 3.2 COPING INSTALLATION

- A. General: Install roof specialties according to manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete roof-specialty systems.
  - 1. Corner Support Clips: Locate and fasten galvanized corner support clips to wall.
  - 2. Miter Splice Plate and Anchor Clip: Position the splice plate in the center of the anchor clip. Install the splice plate and anchor clip assembly into each other.
  - 3. Miter: Place the miter corner assembly into position and secure at the exposed edge of the anchor clips.
  - 4. Endcap Anchor Clips: Locate and fasten galvanized anchor clips to wall with provided fasteners for substrate using the third full top hole from the inside face bend, and the first full hole from the outside face bend.
  - 5. Endcap Splice Plates: Remove release paper from top of factory applied sealant strips. Place splice plate onto second anchor clip as shown.
  - 6. Endcap: Hook outside face of endcap over the anchor clips and rotate into place. Engage near leg onto anchor clips by pressing downward until snap lock occurs.
  - 7. Coping Anchor Clips: Locate and fasten galvanized anchor clips to wall 4'-0" on center to provided fasteners. Use the third full hold from the inside face bend and the fist hole from the outside face bend.
  - 8. Coping Splice Plates: Place splice plates onto anchor clips at splice joints, 12'-0" on center. Remove release paper from sealant strips.
  - 9. Coping Panels: Hook outside face of coping over the anchor clips and rotate into place. Engage rear leg onto anchor clips by pressing downward until snap lock occurs. Continue installing panels with a 3/8" space between each. Field cut where necessary using a fine-tooth hacksaw. Remove clear protective film.

#### 3.3 SCUPPER AND DOWNSPOUT INSTALLATION

- A. Install downspouts in accordance with SMACNA Figure 1-35G, space straps at 48 inches on center.
- B. Install conductor heads and downspouts after application of exterior wall coating.
- C. Install scuppers in accordance with SMACNA Figure 1-26 or Figure 1-30, as applicable, except as otherwise shown on the drawings. Install TPO coated metal scuppers in accordance with Manufacturer's instructions. Install scuppers before installation of roofing membrane.
- D. Apply bituminous coating on backside of conductor heads and downspouts and on other downspout, and accessories surfaces in contact with dissimilar materials, masonry, and preservative treated wood.

3.4 CLEANING AND PROTECTION

- A. Clean and neutralize flux materials. Clean off excess solder and sealants.
- B. Remove temporary protective coverings and strippable films as roof specialties are installed.

END OF SECTION 077100

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 077100 – ROOF SPECIALTIES

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the roof specialties are installed and are in general conformance with the Contract Documents, applicable Codes, and shop drawings. The roof specialties have been provided and placed in operational condition in accordance with the Manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

ROOF SPECIALTIES INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address) Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address) Phone Number: (    ) \_\_\_\_\_

## SECTION 079200 - JOINT SEALANTS

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section Includes:
  - 1. Joint sealants for interior and exterior joints in vertical surfaces and horizontal non-traffic surfaces.
  - 2. Joint sealants and fillers in interior concrete floor slab-on-grade joints.
  - 3. Joint sealant and fillers in exterior concrete sidewalks and pavement adjacent to building.
- B. Related Requirements as required per Project Manual:
  - 1. Division 32 - Joint fillers and sealants for joints in sidewalk and pavement not adjacent to building.
  - 2. Section 042200 – Concrete Unit Masonry: Installation of expansion joint filler (compression seal) and control joint sealer in masonry walls.
  - 3. Section 075423 – Thermoplastic-Polyolefin Roofing: Sealants associated with roofing.
  - 4. Section 096500 - Resilient Flooring: Joint subfloor filler for control/construction joints concealed by floor finish material.
  - 5. Section 099000 - Painting and Coating: Protection of wall joints from painting prior to sealing.

## 1.2 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only
- B. ASTM International (ASTM):
  - 1. ASTM C 920 - Elastomeric Joint Sealants.
  - 2. ASTM C 1330 - Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants.
  - 3. ASTM D 1056 - Flexible Cellular Materials-Sponge or Expanded Rubber.
  - 4. ASTM E 84 - Surface Burning Characteristics of Building Materials.

## 1.3 QUALITY ASSURANCE

- A. Installer Qualifications:
  - 1. Certified by the manufacturer as qualified to install the material to be used.
  - 2. At least 15 projects performed by Installer within the last 3 years and similar in type and size to this project.

## 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Transport, handle, store and protect products in compliance with the requirements of Section 016000.

## 1.5 PROJECT CONDITIONS

- A. Do not install solvent curing sealants in enclosed building spaces.
- B. Maintain temperature and humidity recommended by sealant manufacturer during and after installation.
- C. Do not proceed with installation of joint sealants under the following conditions:
  - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer.
  - 2. When joint substrates are wet.
  - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.

4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

## PART 2 - PRODUCTS

### 2.1 ELASTOMERIC SEALANTS (BUILDING)

- A. General: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
- B. Sealants specified herein shall be used unless otherwise recommended by manufacturers for the surfaces, joints, and conditions of the specific application involved.
- C. Manufacturers: Provide products by the following manufacturers to the extent specified for the specific product.
  1. Sonneborn Products by BASF Building Systems. (800) 433-9517 or (952) 496-6000.
  2. Convenience Products, (800) 325-6180.
  3. CSS Polymers, Inc., (770) 645-0101.
  4. Dow Corning Corporation. Mary Altenburg, (989) 496-7767.
  5. Euclid Chemical Co., (877) 438-3826.
  6. GE Silicones & GE Sealants and Adhesives. (Momentive Performance Materials) (877) 943-7325.
  7. HI-TECH Systems (800) 454-5530.
  8. Metzger/McGuire, (800) 223-6680.
  9. Pecora Corporation. (215) 796-1401, Keith Waters.
  10. Tremco Sealant/Weatherproofing Division. (800) 841-3778.
  11. VersaFlex Inc., (913) 321-1416.
  12. W. R. Meadows, Inc., (847) 214-2100.
- D. Polyurethane Sealants:
  1. Polyurethane Sealant #1 (P1): ASTM C 920, Type S, Grade NS, Class 25, single component.
    - a. Vulkem 116, Dymonic, or Dymonic FC by Tremco.
    - b. Dynatrol I-XL, by Pecora.
    - c. MasterSeal NP 1 by BASF - Sonneborn.
  2. Polyurethane Sealant #2 (P2): ASTM C920, Type S, Grade P, Class 25, single component.
    - a. Vulkem 45, by Tremco.
    - b. Urexpan NR-201, by Pecora.
    - c. MasterSeal SL 1 by BASF - Sonneborn.
  3. Polyurethane Sealant #3 (P3): ASTM C 920, Type M, Grade NS, Class 50, multi-component.
    - a. Dymeric 240FC, by Tremco.
    - b. MastserSeal NP 2 by BASF - Sonneborn.
    - c. Dynatrol II, by Pecora.
- E. Silicone Sealants:
  1. Silicone Sealant #1 (S1): ASTM C 920, Type S, Grade NS, Class 25.
    - a. Spectrem 1, Spectrem 2 or Spectrem 3 by Tremco.
    - b. 791 Silicone Perimeter Sealant, by Dow.
    - c. 864 or 890 by Pecora.
    - d. MasterSeal NP 150 by BASF - Sonneborn.
    - e. SilPruf, by GE.
    - f. Titebond 100% Silicone Sealant by Franklin International.
  2. Silicone Sealant #2 (S2): ASTM C 920, Type S, Grade NS, Class 25, mildew resistant.
    - a. Tremsil 200, by Tremco.
    - b. 898 by Pecora.
    - c. 786 Silicone Sealant, by Dow.
    - d. Sanitary SCS 1700, by GE.



## F. Sealant Color:

1. For interior and exterior exposed to view areas, match color of adjacent paint color finish or other adjacent finish color.
2. For joints where plumbing fixtures meet adjacent floor and wall finishes, match color of plumbing fixture.
3. Use clear sealant where applied to stainless steel surfaces.

## 2.2 JOINT FILLER (BUILDING)

## A. Preformed Control Joint Filler:

1. Regular Joint: 2-5/8 inches by 1-1/2 inches; rubber.
  - a. RS-STANDARD Control Joint by Hohmann & Barnard, Inc., Hauppauge, NY (800) 645-0616.
  - b. Masonry Control Joint No. 571 by Greenstreak, St. Louis, MO (800) 325-9504.
2. Tee Joint: 2-5/8 inches by 1 inch; rubber.
  - a. RS-TEE Control Joint by Hohmann & Barnard, Inc.
  - b. Masonry Control Joint No. 572 by Greenstreak.

## B. Expansion Joint Filler (Compression Seal):

1. Backerseal (Grayflex) expanding precompressed foam by Emseal Joint Systems, Ltd., Westborough, MA (800) 526-8365.
2. Willseal 600 polyurethane foam joint sealing tape by Willseal USA, Pelham, NH (800) 438-0684.

## 2.3 JOINT-SEALANT BACKING (BUILDING)

## A. Sealant Backing (Backer Rod): Provide sealant backings of material and type that are non-staining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

1. Cylindrical Sealant Backings: Closed or bi-cellular backer rod conforming to ASTM C 1330 Type B or Type C, approved by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance. The use of ASTM C Type O open cell backer rod is prohibited.
  - a. Backer Rod for Exterior Masonry: Closed cell foam, oversized 50 percent; self-expanding.
2. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056.

## B. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

## 2.4 INTERIOR SLAB ON GRADE JOINT SEALANT MATERIALS

## A. Elastomeric Joint Materials:

1. Sealant:
  - a. Polyurethane Sealant: No. 2 (P2) as specified above.
  - b. Color: Match color of adjacent exposed surface of concrete slab..
  - c. Sealant shall be compatible with construction material placed against it.
2. Joint Back-Up Material:
  - a. Polyethylene Foam, 100% closed cell.
  - b. Material shall be compatible with construction material to be placed against it such as tile adhesive.

## B. Polyurea Joint Filler (PY1): Rapid setting, two-component polyurea polymer liquid of 100% solids content, Shore A Hardness 85 to 92, compatible with construction material placed against it.

1. Spall-Pro RS 88 by Metzger/McGuire.
2. Euco Qwik Joint 200, by Euclid Chemical.
3. Hi-Tech PE85 by HI-TECH Systems.

4. VersaFlex SL/85 by VersaFlex.
5. Quick Joint 85 by CSS Polymers.
6. Match color of adjacent exposed surface of concrete floors.

C. Joint Filler Stain Preventing Film:

1. SPF by Metzger/McGuire.
2. Euco CleanCut by Euclid.

2.5 EXTERIOR SIDEWALK AND PAVEMENT JOINT MATERIALS

A. Joint Back-up Material: Polyethylene foam, 100% closed cell.

B. Sealant:

1. Dow 888 by Dow Corning.
2. 301 NS by Pecora.
3. Spectrum 800 or 900 by Tremco.

C. Soft Preformed Joint Filler: Flexible closed-cell non-extruding synthetic foam expansion joint strips.

1. Ceramar Flexible Foam Expansion Joint, by W.R. Meadows.
2. Deck-O-Foam Expansion Joint Filler, by W.R. Meadows

2.6 ACCESSORIES

A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.

B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

2.7 SUBSTITUTIONS

A. Comply with the requirements of Section 016000.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that surfaces and joint openings are ready to receive work and field measurements are as indicated on Drawings.

3.2 PREPARATION

A. Clean and prime joints in accordance with manufacturer's instructions.

B. Remove loose materials and foreign matter which might impair adhesion of sealant.

C. Remove joint backing material previously inserted to protect joint from painting.

D. Verify that joint backing and release tapes are compatible with sealant.

E. Protect elements surrounding work of this Section from damage or disfiguration.

3.3 INSTALLATION

A. Install sealant in accordance with manufacturer's instructions.

B. Measure joint dimensions and size materials to achieve required width/depth ratios.

JOINT SEALANTS

- C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
  - 1. Do not leave gaps between ends of sealant backings.
  - 2. Do not stretch, twist, puncture, or tear sealant backings.
  - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install bond breaker where joint backing is not used.
- E. Apply sealant within recommended temperature ranges. Consult manufacturer when sealant cannot be applied within recommended temperature ranges.
- F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
- G. Tool joints concave.

### 3.4 INTERIOR SLAB ON GRADE JOINT SEALING AND FILLING

- A. General:
  - 1. Seal/fill contraction, isolation and construction joints in floor slabs and pavements, unless otherwise indicated on Drawings or specified herein.
  - 2. Unless noted otherwise, use polyurea joint filler in floor slab contraction and construction joints.
  - 3. Use elastomeric joint sealant in isolation joints and textured concrete joints.
  - 4. Do not seal joints under resilient flooring or carpet with materials specified herein. Reference Section 096500 for joint subfloor filler materials and placement under floor covering.
- B. Cleaning:
  - 1. Immediately prior to sealing/filling, clean joints to full depth of sealant/filler in accordance with manufacturer's recommendation.
  - 2. Remove dirt, debris, saw laitance, and other foreign material from joint. Clean inner joint walls mechanically using dustless dry-cut saw, or similar tool, to the full depth of saw cuts and 2 inch minimum depth in construction joints that may have not been saw cut to create a support shelf.
  - 3. Remove form release agent, curing compound, or other components.
- C. General Installation:
  - 1. Commence placing floor joint sealant/filler no sooner than 30 days after first placement of concrete.
  - 2. If joint is wet or damp, allow joint to dry for 72 hours prior to filling.
  - 3. Delay floor joint sealing / filling operations until facility's environmental systems have been placed in operation for 14 days.
  - 4. Mix and install sealant and filler in accordance with manufacturer's recommendations. Use primer if recommended for specific application.
  - 5. Choke off shrinkage crack if necessary at bottom of contraction joint or void below construction joints by the following methods.
    - a. Saw Cut Contraction Joints:
      - 1) Place 1/8 inch to 1/4 inch (maximum) layer of dry-bagged silica sand in joint to be epoxy filled. Do not use compressible backer rod.
    - b. Construction Joints Through Slab: Fill by one of the following methods:
      - 1) Fill joint with dry-bagged silica sand to within 2 inches of slab surface.
      - 2) Insert compressible backer rod to a minimum depth of 2 inches below slab surface.
  - 6. Do not allow sealant / filler to extend over joint edges in finished condition.
- D. Elastomeric Joint Sealant Installation:
  - 1. Use joint back-up material.
  - 2. Tool surface where required to provide smooth, attractive appearance and geometry recommended by sealant manufacturer.

## E. Polyurea Joint Filler Installation:

1. Installation shall be by Installer who is approved in writing by the manufacturer's corporate office for this project.
2. Do not use joint back-up material (i.e. backer rod, sand, etc.) except below bottom of saw cut in construction joints. Provide a minimum joint filler depth of 2 inches for backer rod material.
3. Install test sample of the polyurea joint filler to determine if filler will leave a stain, shadow, or film on slab surface.
4. If test sample reveals stain, shadow, or film, use joint filler stain preventing film at joints to receive polyurea joint filler.
5. Fill joint using single pass method. Fill joint full depth from bottom to top, leave slight crown at slab surface.
6. Add extra filler prior to filler set if needed to prevent depressed areas. If concave filler is already set, abrade with wire wheel or similar tool to minimum depth of 1/4" below surface prior to refilling.
7. Razor off crowned filler flush with floor surface after filler has sufficiently set.
8. Remove stain preventing film if used. Film shall be removed by joint filler installer immediately after shaving joint filler.
9. One week prior to Substantial Completion, refill joints if:
  - a. Joint filler sidewall separation or splitting exceeds 1/32 in.
  - b. Joint filler surface profile is concave, crowned, or chattered or if voids occur.
10. Follow manufacturer's requirements for joint preparation for proper adhesion.

## F. Isolation Joints: Form isolation joints of preformed joint-filler strips (PMEJ) where indicated.

1. Extend joint fillers full width and depth of joint.
2. Terminate joint filler or otherwise provide joint sealant cavity of not less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.
3. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
4. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
5. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

## 3.5 EXTERIOR SIDEWALK AND PAVEMENT JOINT SEALING AND FILLING

- A. Fill and seal sidewalk and pavement joints in areas of pavement adjacent to the building. Joint filling and sealing of sidewalks and pavement not adjacent to building is specified in Division 32.
- B. Joint Fillers: Extend joint fillers full-width and depth of joint, and not less than 1/2-inch or more than 1-inch below finished surface where joint sealer is indicated. Furnish joint fillers in 1-piece lengths for full width being placed, wherever possible. Where more than 1 length is required, lace or clip joint filler sections together.
- C. Joint Sealants: Joints shall be sealed as shown and scheduled and shall be installed in accordance with manufacturer's recommendations.

## 3.6 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

## 3.7 SCHEDULE

- A. Provide sealants in accordance with the following schedule as applicable. Joint sealing required by the drawings or required for a complete and proper installation but not listed in the following schedule shall be sealed as necessary regardless of whether shown or scheduled. Such joints not shown or scheduled shall be sealed with sealants consistent with specified materials or as recommended by the manufacturer for the specific application.

EXTERIOR JOINTS				
	MATERIAL TO	MATERIAL	JOINT WIDTH	SEALANT TYPE
SITE	Concrete Sidewalk Control Joint	Concrete Sidewalk	1/4"	Sidewalks adjacent to Building: See MATERIALS Par. Otherwise: See Division 32.
	Concrete Sidewalk Expansion Joint	Concrete Curb	1/2"	Same
	Concrete Sidewalk Expansion Joint	CMU Wall	1/2"	Same
	Concrete Paving Control Joint	Concrete Paving	1/4"	Pavement adjacent to Building: See MATERIALS Par. Otherwise: See Division 32.
	Concrete Paving Expansion Joint	Concrete Paving	1/2"	Same
	Concrete Paving Expansion Joint	Concrete Floor Slab	1/2"	Same
	Concrete Curb Expansion Joint	Concrete Curb	1/2"	See Division 32
	Concrete Curb Expansion Joint	CMU Wall	1/2"	Same
BUILDING WALL	CMU Wall Control Joint, 3/8"	CMU Wall	3/8"	P1 or P3
	CMU Wall Expansion Joint, 1"	CMU Wall	1"	P1 or P3
WALL FLASHING	Metal Flashing	Metal Flashing		S1
	Metal Flashing	CMU Wall	1/4"	P1 or P3
	Metal Flashing	Aluminum Storefront Frame	1/4"	P1 or P3
WALL PENETRATIONS	Aluminum Storefront Frame	Aluminum Storefront Frame	1/4"	P1 or P3
	Aluminum Storefront Frame	CMU Wall	1/4"	P1 or P3
	Aluminum Storefront Door Threshold	Concrete Slab		P1 or P3
	Hollow Metal Door Frame	CMU Wall	1/4"	P1 or P3
	Hollow Metal Door Threshold	Concrete Slab		P1 or P3
	Steel Corner Angle Frame	CMU Wall	1/4"	P1 or P3
	Steel Pipe Through	CMU Wall	1/2"	P1 or P3
	Steel Conduit Through	CMU Wall	1/2"	P1 or P3
	Ganged Steel Conduit Through	CMU Wall	1/2"	P3
	PVC Pipe Through	CMU Wall	1/2"	P1 or P3

## JOINT SEALANTS

EXTERIOR JOINTS				
	MATERIAL TO	MATERIAL	JOINT WIDTH	SEALANT TYPE
	Copper Pipe Through	CMU Wall	1/2"	P1 or P3
ROOF MEMBRANE AREA	Roofing Membrane	Roofing Membrane		See Section 075423
	Roofing Membrane	Waterproof Wall Membrane		See Section 075423
	Roofing Membrane	Metal Fascia		See Section 075423
	Roofing Membrane	Molded Pipe Flashing		See Section 075423
	Waterproof Membrane	Metal Fascia		P1 or P3
	Waterproof Membrane	Metal Plates and Bolts		P1 or P3
	Waterproof Membrane	Steel Conduit	1/2"	P1 or P3
	RTU Flashing Joints	RTU Flashing		S1
	Waterproof Membrane Termination Bar	CMU Wall	1/4"	S1
	Steel Downspout	Steel Downspout		S1
	Urethane Rubber Seal System	Steel Pipe/ Flue	Varies	See Section 075423

INTERIOR JOINTS				
	MATERIAL TO	MATERIAL	JOINT WIDTH	SEALANT TYPE
FLOOR	Concrete Floor	Concrete Floor		
	Contraction and Construction Joint		1/4"	See Par MATERIALS
	Expansion Joint		3/4"	Same
	Isolation Joint		See Dwgs	Same
	Floor Joints Beneath Floor Finish Materials (VCT)			See Section 096500 (Resilient Flooring)
	Mop Sink	Floor		P1 or P3
WALLS	CMU Wall Control Joint, 3/8"	CMU Wall	3/8"	P1
	CMU Wall Expansion Joint, 1"	CMU Wall	1"	P1
	Gypsum Board	CMU Walls	3/8"	P1
	Rubber Base	Gypsum Board Wall		P1 or P3
	Rubber Base	Concrete Floor		P1 or P3
	Joints shown on the drawings to be sealed with Expanding Foam Sealant			EF1
WALL	Aluminum Storefront Frame	Alum Storefront	1/4"	P1

INTERIOR JOINTS				
	MATERIAL TO	MATERIAL	JOINT WIDTH	SEALANT TYPE
PENETRATIONS		Frame		
	Aluminum Storefront Frame	CMU Wall	1/4"	P1
	Aluminum Storefront Frame	Gypsum Board Wall	1/4"	P1
	Hollow Metal Door Frame	CMU Wall	1/4"	P1
	Hollow Metal Door Frame	Gypsum Board Wall	1/4"	P1
	Steel Structural Member Through	Gypsum Board Wall	1/4"	P1
	Steel Corner Angle Frame	CMU Wall	1/4"	P1
	Steel Pipe Through	CMU Wall	1/2"	P1
	Steel Pipe Through	Gypsum Board Wall	1/4"	P1
	Steel Conduit Through	CMU Wall	1/2"	P1
	Steel Conduit Through	Gypsum Board Wall	1/4"	P1
	PVC Pipe Through	CMU Wall	1/2"	P1
	PVC Pipe Through	Gypsum Board Wall	1/2"	P1
	Copper Pipe Through	CMU Wall	1/2"	P1
	Copper Pipe Through	Gypsum Board Wall	1/2"	P1
TOILET FIXTURES	Sink	Gypsum Board Wall		S2
	Floor Mount Toilet	Gypsum Board Wall		S2
	Wall Mount Toilet	Gypsum Board Wall		S2
COUNTER TOPS	Plastic Laminate Counter Tops	Gypsum Board Walls		S2
	Plastic Laminate Counter Tops	Plastic Laminate Walls		S2

END OF SECTION 079200

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 079200 – JOINT SEALANTS

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

## Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the joint sealants are installed and are in general conformance with the Contract Documents, applicable Codes, and shop drawings. The “Systems” have been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

## JOINT SEALANT INSTALLER:

\_\_\_\_\_  
(Subcontractor Signature)\_\_\_\_\_  
(Subcontractor name and address) Phone Number: (    ) \_\_\_\_\_

## CONTRACTOR:

\_\_\_\_\_  
(Contractor Signature)\_\_\_\_\_  
(Contractor name and address) Phone Number: (    ) \_\_\_\_\_



## SECTION 080000 – PROJECT COORDINATION SHEET

The contact information for your project management team is listed below. This includes your DH Pace Single Point of Contact Project Managers contact information. Please reach out to them with any communication in regards to the project.

**Paul Senne & Charles Girtman – [BridgestoneDoors@dhpac.com](mailto:BridgestoneDoors@dhpac.com)**

Office: (417) 831-5585

Project Manager

DH Pace National Accounts - Construction Group

In order for us to best prepare to meet expectations for this project, we need to make sure we have the necessary information. Please complete the needed fields below.

**Site Information**

Jobsite address:	Click here to enter text. Click here to enter text. Click here to enter text.	Ship to address:	Click here to enter text. Click here to enter text. Click here to enter text.
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On-site contact:

Name: Click here to enter text.

Mobile Phone: Click here to enter text.

Email address: Click here to enter text.

**Schedule information:**

<i>Material type</i>	<i>Required Delivery Date</i>
Exterior Frames	Click here to enter a date.
Exterior Doors & Exterior Hardware	Click here to enter a date.
Interior Frames	Click here to enter a date.
Interior Doors & Interior Hardware	Click here to enter a date.

**\*\*Please do not use "ASAP". Please provide a specific date. Thank you\*\***



## SECTION 081113 – HOLLOW METAL DOORS AND FRAMES

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section Includes:
  - 1. Steel doors, panels and frames.
  - 2. Glazed light frames.
  - 3. Framed louvers.
- B. Related Requirements as required per Project Manual:
  - 1. Section 042200 – Concrete Unit Masonry: Masonry mortar fill of metal frames. Placement of anchors into wall construction.
  - 2. Section 087100 - Door Hardware: Door hardware coordination.
  - 3. Section 088000 - Glazing: Glass in steel doors and frames.
  - 4. Section 092900 - Gypsum Board: Door frame attachment to metal wall framing.
  - 5. Section 099000 - Painting and Coating: Field painting of doors and frames.

## 1.2 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.
- B. American National Standards Institute (ANSI):
  - 1. ANSI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
  - 2. ANSI A250.8 (Formerly SDI-100) - Recommended Specifications for Standard Steel Doors and Frames.
  - 3. ANSI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
  - 4. ANSI A250.11 (Formerly SDI-105) - Recommended Erection Instructions for Steel Frames.
- C. ASTM International (ASTM):
  - 1. ASTM C 578 - Rigid, Cellular Polystyrene Thermal Insulation.
  - 2. ASTM A 653 - Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- D. Steel Door Institute (SDI):
  - 1. SDI 111 – Recommended Details for Standard Steel Doors, Frames, Accessories and Related Components.

## 1.3 DELIVERY, STORAGE AND PROTECTION

- A. Section 016000 – Product Requirements: Transport, handle, store, and protect products.
- B. Product Compliance Inspection: Inspect delivered products for compliance with product descriptions in Part 2 herein. Report discrepancies to the Architect.
- C. Product Packaging: Doors will be shipped in manufacturer's standard packaging with identification markings on each component or package.
- D. Verify quantity of products furnished with Bills of Lading provided with products.
- E. Protect doors and frames with resilient packaging. Break seal on-site to permit ventilation.

## 1.4 PROJECT CONDITIONS

- A. Field Measurements: Verify that field measurements are as indicated on shop drawings.
- B. Coordination: Coordinate the work with door opening construction, door frame and door hardware installation.

## PART 2 - PRODUCTS

### 2.1 DOORS

- A. Interior Doors: ANSI A250.8, Level 1 and Physical Performance Level C (Standard-Duty), 1-3/4 inches thick, Model 1 (Full Flush), 0.032 min. thickness (20 gage) cold-rolled steel, optional core construction as specified below.
- B. Exterior Doors: ANSI A250.8; Level 2 and Physical Performance Level B (Heavy Duty), 1-3/4 inches thick, Model 1, (Full Flush), 0.042 min. Thickness (18 gage) unless heavier gage is required to meet wind load requirements as shown on structural drawing S0, ASTM A 653, Commercial Steel (CS), Type B, with an A60 zinc-iron-alloy (galvannealed) coating cold-rolled steel, polyurethane or polystyrene foam insulated core construction as specified below.
  - 1. Fabricate head flush with top edge to exclude water.
- C. Manufacturers: All products in the specification section must be supplied by Bridgestone's National Account Vendor, DH Pace, Inc. No substitutions permitted.
  - 1. DH Pace – 1901 E. 119th Street, Olathe, KS 66061 – [BridgestoneDoors@DHPace.com](mailto:BridgestoneDoors@DHPace.com)  
Phone: (417) 831-5585 – National Accounts PM Team
- D. Core Construction:
  - 1. Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board of vertical steel stiffener core.
    - a. Thermal-Rated (Insulated) Doors: R-value of not less than 2 when tested according to ASTM C 1363. Strength of bond between core and steel face sheet shall exceed strength of core so that delamination will not occur under operating conditions.

### 2.2 FRAMES

- A. Interior Drywall Frames: 0.053 min. thickness (16 gage), cold-rolled steel, mitered welded units.
  - 1. Jamb depth: Sized to fit wall thickness.
- B. Exterior Frames: 0.053 min. thickness (16 gage) steel, A60 galvannealed coating (ASTM A 653), mitered and welded units.
  - 1. Jamb depth: 5-3/4", unless otherwise indicated on Drawings.

### 2.3 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 thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
  - 2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
  - 3. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.
- B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch thick.

### 2.4 LOUVERS

- A. Provide louvers for interior doors, where indicated, that comply with SDI 111, with blades or baffles formed of 0.020-inch thick, cold-rolled steel sheet set into 0.032-inch thick steel frame.
  - 1. Sightproof Louver: Stationary louvers constructed with inverted V-shaped or Y-shaped blades.

## 2.5 ACCESSORIES

- A. Rubber Silencers: Resilient rubber. Specified in Section 087100.
- B. Glazing Stops: Rolled steel channel shape, butted corners; prepared for countersink style screws.
- C. Plaster Guards: Provide 26 gage steel plaster guards or mortar boxes, welded to frame, at back of hardware cutouts in masonry openings.
- D. Board Insulation Blocking: ASTM C 578, Type IV (density 1.6 pcf minimum), 1 inch thick. Provide one of the following or equivalent by another manufacturer:
  - 1. Greenguard - CM, by Pactiv Building Products, Atlanta, Georgia (800) 241-4402. [www.green-guard.com](http://www.green-guard.com).
  - 2. Styrofoam SM, by The Dow Chemical Co, Midland MI, (800) 232-2436. [www.dow.com/styrofoam](http://www.dow.com/styrofoam).
  - 3. Foamular 250, by Owens-Corning, (800) 438-7465. [www.owenscorning.com](http://www.owenscorning.com).

## 2.6 PROTECTIVE COATINGS

- A. Bituminous Coating: Fibered asphalt emulsion, field applied.

## 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 thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Fabricate doors and frames in accordance with ANSI A250.8.
- C. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.
- D. Hollow Metal Doors:
  - 1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
  - 2. Glazed Lites and Louvers: Factory cut openings in doors.
  - 3. Fabricate top and bottom edges of doors with closures of same material as face sheets.
- E. 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. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
  - 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
  - 3. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
  - 4. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
  - 5. Fabricate all exterior frames to have a 4 inch head member.
- F. Silencers: Prepare frames for silencers.
  - 1. Single Doors: Provide 3 single rubber silencers on strike side.
  - 2. Double Doors with Mullions: Provide 3 single rubber silencers on each door, on strike side.
  - 3. Double Doors without Mullions: Provide 2 single silencers on frame head.

- G. Undercut non-fire rated doors as indicated on drawings.
- H. Where multiple openings are indicated, fabricate double wide frames of material gauge as scheduled. Joint frames at swing jamb using minimum 16 gauge insert spline connection full length. After assembly, fill joint with epoxy filler, allow to harden, and finish smooth and flush.
  - 1. Fabricate impost base anchor, providing for minimum of two anchors per impost. Base shall fit impost inside profile with "force fit."
- I. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware as specified in Section 087100.
  - 1. Fabricate doors and frames with hardware reinforcement welded in place.
  - 2. Locate hardware as indicated, or if not indicated, according to ANSI A250.8.
  - 3. Reinforce doors and frames to receive non-templated, mortised and surface-mounted door hardware.
  - 4. Comply with applicable requirements in ANSI A250.6 for preparation of hollow metal work for hardware.
  - 5. Coordinate locations of conduit and wiring boxes for electrical connections with Division 16 electrical Sections.
  - 6. Provide mortar guard boxes.

## 2.8 STEEL FINISHES

- A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.
- B. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify substrate conditions, opening sizes and tolerances are acceptable for proper installation.

### 3.2 INSTALLATION

- A. Install frames in accordance with ANSI A250.11.
- B. Install doors in accordance with ANSI A250.8.
- C. Do not field cut hollow metal doors.
- D. Coordinate with adjacent wall construction for anchor placement.
- E. Coordinate installation of glass and glazing.
- F. Coordinate installation of factory installed louvers.
- G. Coordinate installation of doors with installation of hardware specified in Section 087100.
- H. Provide board insulation blocking at exterior hollow metal frames. Glue blocking in frame jambs (strike side and hinge side) at height indicated on Drawings.

### 3.3 ADJUSTING AND CLEANING

- A. Test for smooth operation through full range of swing; make necessary adjustments.

## HOLLOW METAL DOORS AND FRAMES

- B. Coordinate adjustment of doors with installation of hardware. Adjust doors and hardware for smooth and balanced door movement.

END OF SECTION 081113

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 081113 – HOLLOW METAL DOORS AND FRAMES

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the hollow metal doors and frames are installed and are in general conformance with the Contract Documents, applicable Codes, and shop drawings. The products have been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

HOLLOW METAL DOOR AND FRAME INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (     )\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (     )\_\_





## SECTION 083100 - ACCESS DOORS AND PANELS

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section Includes:
  - 1. Non-fire rated access doors and frames for walls.
- B. Related Requirements:
  - 1. Section 092900 - Gypsum Board: Openings in gypsum board walls.
  - 2. Section 099000 - Painting and Coating: Field paint finish.

## 1.2 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.
- B. ASTM International (ASTM):
  - 1. ASTM A 653 - Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
  - 2. ASTM A 879 - Steel Sheet, Zinc Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface.
  - 3. ASTM A 1008 - Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.
  - 4. ASTM E 119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

## PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

- A. Provide access doors by one of the following manufacturers:
  - 1. Milcor, Inc., (Commercial Products Group), Bensenville, IL. (630) 595-7320, Don Fessenden.
  - 2. Acudor Products, Inc., Fairfield, NJ. (800) 722-0501.
  - 3. Nystrom Building Products, Minneapolis, MN. (800) 547-2635 or (612) 781-7850.
- B. Substitutions: Not Permitted.

## 2.2 STEEL MATERIALS

- A. Steel Sheet: Uncoated or electrolytic zinc-coated, ASTM A 879 with cold-rolled steel sheet substrate complying with ASTM A 1008, Commercial Steel (CS), exposed.
- B. Metallic-Coated Steel Sheet: ASTM A 653, Commercial Steel (CS) with A60 zinc-iron-alloy (galvannealed) coating or G60 mill-phosphatized zinc coating.
- C. Drywall Beads: 0.0299-inch zinc-coated steel sheet to receive joint compound.
- D. Manufacturer's standard finish factory primed finish.

## 2.3 ACCESS DOORS AND FRAMES FOR WALLS

- A. Flush Access Doors and Frames
  - 1. Fabricated from steel sheet.
  - 2. Exposed Trim Type:

- a. Model NT by Nystrom.
  - b. Model M 3202 by Milcor.
  - c. Model UF 5000 by Acudor.
  - d. Model UF 5500 by Acudor (Exterior Rated)
3. Locations: Wall.
4. Door: Minimum 0.060-inch- thick sheet metal.
5. Frame: Minimum 0.060-inch- thick sheet metal with 1-1/4-inch- wide, surface-mounted trim.
6. Hinges: Spring-loaded, concealed-pin type
7. Latch: Slot Screwdriver operated Cam latch with interior release. Provide latch for all units unless specified to have locks.
8. Units larger than 24 inches on the hinge side shall have two locks or latches.

- B. Size: Minimum 36 x 36 inches except where otherwise indicated on the drawings.

## 2.4 FINISH

- A. Base Metal Protection: Factory prime coat units with electrostatic baked on electrostatic powder.

## PART 3 - EXECUTION

### 3.1 INSPECTION

- A. Verify rough openings for door and frame are correctly sized and located.
- B. Beginning of installation means acceptance of existing conditions.

### 3.2 INSTALLATION

- A. Install units in accordance with manufacturer's instructions.
- B. Install units plumb, square and flush with adjacent wall surface. Secure rigidly in place.
- C. Position to provide convenient access to concealed work requiring access.

### 3.3 ACCESS DOOR SCHEDULE

- A. Install access doors in walls in locations as shown on the Drawings.

END OF SECTION 083100

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 083100 – ACCESS DOORS AND PANELS

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the access doors and panels are installed and are in general conformance with the Contract Documents, applicable Codes, and shop drawings. The access doors and panels have been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

ACCESS DOOR AND PANEL INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address) Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address) Phone Number: (    ) \_\_\_\_\_



## SECTION 083613 - SECTIONAL DOORS

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section Includes: Manually operated, insulated sectional overhead doors.
- B. Related Requirements:
  - 1. Section 016000 – Product Requirements: General procedures related to products.
  - 2. Section 079200 - Joint Sealants: Installation of adhesive at door perimeter weather seal.

## 1.2 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.
- B. American National Standards Institute (ANSI):
  - 1. ANSI Z97.1 - For Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.
- C. ASTM International (ASTM):
  - 1. ASTM A 653 - Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
  - 2. ASTM C 1048 - Heat-Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass.
  - 3. ASTM E 330 - Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
- D. American Society of Civil Engineers/Structural Engineering Institute (ASCE/SEI)
  - 1. ASCE/SEI 7 - Minimum Design Loads for Buildings and Other Structures.
- E. Consumer Product Safety Commission (CPSC):
  - 1. CPSC 16 CFR Part 1201.
- F. Door and Access Systems Manufacturer's Association International (DASMA)
  - 1. DASMA 102 - Sectional Overhead-Type Doors.
  - 2. DASMA 108 - Standard Method for Testing Sectional Garage Doors and Rolling Doors: Determination of Structural Performance Under Uniform Static Air Pressure Difference.

## 1.3 QUALITY ASSURANCE

- A. Installation shall be by manufacturer's qualified and authorized installers. Installation by unauthorized installers will not be accepted.

## 1.4 DELIVERY, STORAGE AND HANDLING

- A. Product Packaging: Deliver overhead doors in manufacturer's original packaging with identification markings on each component or package.
- B. Acceptance at Site: Inspect products upon delivery of products to Site to verify quantity of products furnished and shall report discrepancies in quantity delivered or obvious damage to products delivered to the site.
- C. Handle, store, and protect products in accordance with Section 016000 and manufacturer's recommendations.

## SECTIONAL DOORS

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Sectional doors shall meet performance requirements specified without failure due to defective manufacture, fabrication, installation, or other defects in construction and without requiring temporary installation of reinforcing components.
- B. Structural Performance: Provide doors designed to sustain wind load pressures shown on the drawings as calculated by the manufacturer in accordance with ASCE/SEI 7. (See Structural Drawings) Exterior sectional doors shall withstand the effects of gravity loads, and the loads and stresses within limits and under conditions, locations, and door sizes indicated when tested in accordance with ASTM E 330 or DASMA 108.
- C. Doors shall withstand design wind loads without evidencing deformation or disengagement of door components, shall remain in the opening throughout the duration of the test, and shall be deemed fully operable at the conclusion of the test in accordance with test standards specified above.

### 2.2 MANUFACTURERS

- A. Clopay Building Products Company, Mason, OH: Contact: Clopay National Accounts; Telephone: (833) 864-2242; [csi@clopay.com](mailto:csi@clopay.com).
- B. Substitutions not allowed.

### 2.3 STEEL SECTIONAL OVERHEAD DOORS

- A. General:
  - 1. Provide overhead doors manufactured as a complete assembly. Provide each door assembly comprising door panels, brackets, tracks, counterbalance mechanisms, and hardware, as required for the opening size and headroom available.
  - 2. Vision Panels: Provide doors with three(3) or four(4) full vision sections based on door height with pre-painted frames to match specified color. Provide glazing as follows:
    - a. 1/8-inch safety glass.
    - b. 1/2-inch insulated safety glass.
  - 3. Finish: Two coat baked-on polyester factory finish, applied to both exterior and interior faces.
    - a. Color: As indicated on Drawings.
  - 4. Exhaust Port: Manufacturer's standard 4-inch, installed in center of bottom section.
  - 5. Interior Step Plate: High impact steel step plate:
    - a. Model 0120690, by Clopay.
    - b. Substitutions not allowed.
  - 6. Spring Bumper: Manufacturer's standard.
  - 7. Lift Rope: For manually operated doors, provide 5/16" diameter rope of sufficient length to facilitate operation of the door.
- B. Model: Clopay Model 3200.
  - 1. Steel Door Sections: Ribbed and textured profile, minimum 0.016 inch thick structural quality carbon steel (interior face) and minimum 0.022 inch thick structural quality carbon steel (exterior face) G40 galvanized in accordance with ASTM A 653.
    - a. Panel Thickness: 2 inch min.
  - 2. Tracks, Supports, and Accessories: track designed for 3 inch rollers, galvanized, with leaf bumpers (stops), brackets, bracing, and reinforcing as required. Track arrangement shall be as indicated on Drawings.
  - 3. Weather Seals:
    - a. Brush Seal will be 2" aluminum retainer and 1 1/2" brush.
    - b. Brush Seal will be ordered the exact size to match door size.
    - c. 10'2" x 10' doors will have 3 pcs of 10' brush

## SECTIONAL DOORS

- d. 10'2" x 12' doors will have 1 pc of 10' brush and 2 pcs of 12' brush.
- e. 6'-2"x10' doors will have 1 pc of 6' brush and 2 pcs of 10' brush.
- f. Substitutions not allowed.
- 4. Counterbalance: 50,000 cycle torsion spring mechanism.
- 5. Hardware: Chrome plated or galvanized.
- 6. Exhaust Port: Manufacturer's standard 4-inch, installed in center of bottom section.
- 7. Interior Step Plate: High impact steel step plate:
  - a. Model 0120690, by Clopay.
  - b. Substitutions not allowed.
- 8. Lock: Interior mounted slide.
- 9. Spring Bumper: Manufacturer's standard.
- 10. Insulation: Manufacturer's standard polystyrene.
- 11. Thermal Values: R-value of 9.1; U-value of 0.11.
- 12. Lift Rope: For manually operated doors, provide 5/16" diameter rope of sufficient length to facilitate operation of the door.
- 13. Rollers: 3 inch diameter, Heavy duty with steel ball bearings in case hardened steel races.
- 14. Substitutions not allowed.

C. Fabrication:

- 1. Fabricate sectional doors to comply with DASMA 102 unless otherwise indicated.
- 2. Fabricate door sections not more than 24 inches high, with horizontal meeting edges rolled to form weather seal.
- 3. Enclose ends and provide reinforcing required for stability.

D. Anchorage Devices: Anchorage to meet manufacturers recommendations and relevant code.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine surfaces and substrates receiving attachments. Verify opening sizes, tolerances, reinforcements, and conditions are acceptable. Do not proceed with Work until unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Coordinate construction of door openings within walls. Verify door head is parallel to floor.
- B. Coordinate installation and locations of structural supports for door assembly.

### 3.3 INSTALLATION

- A. Install doors in accordance with manufacturer's published instructions.
  - 1. Position stops so bottom edge of door is flush with top of opening when door is in up position.
- B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.
- C. Fit and align assembly including hardware, level and plumb, to provide smooth operation.
- D. General Contractor to grout concrete masonry unit cells for attachment of track and counterbalance mechanism.
- E. General Contractor to install metal fabrications for support and attachment of door assembly, where required.

- F. Exhaust Port: Install in center of bottom section in closed position. Install with hinge on upper surface.
- G. Interior Step Plate: Install on bottom door section below slide lock.
- H. Spring Bumper: Position on horizontal track per manufacturer's recommendations.
- I. Install sealants at joints around frames and tracks as specified in Section 079200.

#### 3.4 PROTECTION

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

END OF SECTION 083613



CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 083613 – SECTIONAL DOORS

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

## Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the sectional doors are installed and are in general conformance with the Contract Documents, applicable Codes, and shop drawings. The sectional doors have been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

## SECTIONAL DOOR INSTALLER:

\_\_\_\_\_  
(Subcontractor Signature)\_\_\_\_\_  
(Subcontractor name and address) Phone Number: (    ) \_\_\_\_\_

## CONTRACTOR:

\_\_\_\_\_  
(Contractor Signature)\_\_\_\_\_  
(Contractor name and address) Phone Number: (    ) \_\_\_\_\_



## SECTION 083800 - TRAFFIC DOORS

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section Includes:
  - 1. Full-height traffic doors.
- B. Related Requirements:
  - 1. Section 016000 – Product Requirements: General procedures related to products.

## 1.2 DELIVERY, STORAGE AND HANDLING

- A. Transport, handle, store, and protect products in compliance with the requirements of Section 016000 and manufacturer's recommendations.
- B. Product Packaging: Doors will be shipped in manufacturer's standard packaging with identification markings on each component or package.
- C. Store doors and accessories in unopened packages in protected dry area to prevent damage from environmental and construction operations.

## PART 2 - PRODUCTS

## 2.1 PRE-NEGOTIATED SUPPLIER

- A. All products in the specification section must be supplied by Bridgestone's National Account Vendor, DH Pace, Inc. No substitutions permitted.
  - 1. DH Pace – 1901 E. 119th Street, Olathe, KS 66061 – [BridgestoneDoors@DHPace.com](mailto:BridgestoneDoors@DHPace.com)  
Phone: (417) 831-5585 – National Accounts PM Team
- B. Product Procurement:
  - 1. Unless otherwise noted, products shall be Direct Purchase Products purchased directly by the General Contractor through a Pre-Negotiated Supplier specified above in accordance with requirements specified in Section 016000.
  - 2. Obtain pricing and purchasing instructions through Pre-Negotiated Supplier Contact.
  - 3. Send purchase orders to Pre-Negotiated Supplier contact.

## 2.2 FULL-HEIGHT TRAFFIC DOORS

- A. Description: High impact, fully gasketed plastic traffic door. Provide one of the following models:
  - 1. Model: Retailer, by Chase
  - 2. Model: Q225, by Mueller.
  - 3. Substitutions not allowed.
- B. Door Panel: Solid high density polyethylene panels or non-CFC urethane filled polyethylene plastic sandwich panels with textured surfaces on both sides. Minimum 3/4-inch thickness.
- C. Gaskets (Seals): Provide integrated nylon brush or rubber perimeter seal package. Color: Black.
- D. Hardware: Enclosed stainless steel positive-close double acting hinges interconnected by full length powder coated aluminum spline. Color: Black.

- E. Vision Panel: Integrated, non-gasketed 1/4 inch thick polycarbonate. Size: 200 square inch per leaf. Locate bottom of panel to be not more than 43 inches above finished floor.
- F. Jamb Guards: Space saving low profile integrated steel jamb guards. Color: Matte stainless steel.
- G. Door Color: Charcoal Gray by Mueller or Metallic Gray by Chase.

## 2.3 SUBSTITUTIONS

- A. Comply with the requirements of Section 016000.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify that openings are ready to receive work and opening dimensions and clearances are as indicated on Drawings.

### 3.2 INSTALLATION

- A. Install door unit assembly to manufacturer's installation instructions and manufacturer's location and installation drawings.
- B. Fit and align door assembly level and plumb.
- C. Adjust door assembly to provide smooth operation from closed to full open position.

### 3.3 CLEANING

- A. Remove protective material from pre-finished surfaces.
- B. Remove labels and visible markings.
- C. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Wipe surfaces clean.

END OF SECTION 083800

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 083800 – TRAFFIC DOORS

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

(City &amp; State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

## Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the traffic doors are installed and are in general conformance with the Contract Documents, applicable Codes, and shop drawings. The traffic doors have been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

## TRAFFIC DOOR INSTALLER:

\_\_\_\_\_  
(Subcontractor Signature)\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (     ) \_\_\_\_\_

## CONTRACTOR:

\_\_\_\_\_  
(Contractor Signature)\_\_\_\_\_  
(Contractor name and address)

Phone Number: (     ) \_\_\_\_\_



## SECTION 084313 - ALUMINUM FRAMED STOREFRONTS

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section Includes:
  - 1. Aluminum storefront doors.
  - 2. Door hardware.
- B. Related Requirements:
  - 1. Section 087100 - Finish Hardware: Coordinate cylinders, thresholds and other hardware.
  - 2. Section 088000 - Glazing: Glass products.

## 1.2 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.
- B. American Architectural Manufacturer's Association (AAMA)
  - 1. AAMA 611 - Voluntary Specifications for Anodized Architectural Aluminum.
- C. ASTM International (ASTM):
  - 1. ASTM A 123 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
  - 2. ASTM E 283 - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, And Doors Under Specified Pressure Differences Across the Specimen
  - 3. ASTM E 331 - Water Penetration of Exterior Windows, Skylights, Doors, And Curtain Walls by Uniform Static Air Pressure Difference.
- D. Americans with Disabilities Act of 1990: Accessibility Guidelines for Buildings and Facilities.
- E. American National Standards Institute (ANSI):
  - 1. ANSI A117.1 - Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People.

## 1.3 SYSTEMS DESCRIPTION

- A. Storefront System Performance Requirements:
  - 1. Air Infiltration: ASTM E 283. Air infiltration rate shall not exceed 0.06 cfm/ft<sup>2</sup> at a static air pressure differential of 6.24 psf.
  - 2. Water Penetration Under Static Pressure: Systems do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 6.24 lbs/sq. ft.
  - 3. Structural Performance: Maximum deflection of L/175 of span under a wind load pressure calculation by the Manufacturer based on the design wind loads shown on the Structural Drawings but not less than 20 psf.

## 1.4 QUALITY ASSURANCE

- A. Regulatory Requirements: Conform to disabled access requirements of the following:
  - 1. State or Local requirements (where applicable).
  - 2. ANSI A117.1.
  - 3. ADA (Americans with Disabilities Act - 1990) requirements for entrance door access, entrance doors and hardware.

## PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

1. Manufacturer: Kawneer Company, Inc., Contacts as follows:
    - a. Central Area: Franklin, IN, (877) 505-3757, FAX: (800) 755-4639.
    - b. Eastern Area: Bloomsburg, PA, (877) 505-3756, FAX: (800) 786-4097.
    - c. Southern Area: Springdale AR, (877) 505-3783, FAX: (800) 800-4789.
    - d. Western Area: Visalia, CA, (877) 505-3785, FAX: (800) 759-2810.
  2. Kawneer product designations are used within this Section to identify aluminum framed storefront types and associated products unless noted otherwise.
  3. Alternate Manufacturers: Subject to compliance with project requirements, unless otherwise specified, aluminum framed storefronts and accessories equivalent to the Kawneer products specified by one of the following alternate Manufacturers may be provided:
    - a. EFCO Corporation; Monett, MO; (800) 221-4169.
    - b. Southwest Aluminum Systems, Inc.; Chandler, AZ; (602) 961-2000.
    - c. Tubelite, Inc.; Reed City, MI; (800) 866-2227.
    - d. U.S. Aluminum Corporation; Waxahachie, TX; (800) 627-6440.
    - e. Oldcastle Glass; Shawnee, OK; (866) 653-2278.
- B. Substitutions: Comply with the requirements of Section 01600.

## 2.2 FRAMING

- A. Exterior Framing System: TRIFAB VG 451T, by Kawneer. 2 x 4-1/2 inch nominal dimension, thermally broken extruded aluminum flush glazed framing system
1. Thermal Barrier: Thermal break with a 1/4" separation consisting of a two-part chemically curing, high density polyurethane which is mechanically and adhesively joined to aluminum storefront sections.

Climate Zone	Storefront Type	Glazing
1 - 5	450	1/4" tempered tinted or clear
1 - 5	450	1/4" tempered tinted

- B. Interior Framing System: TRIFAB VG 451, by Kawneer. 2 x 4-1/2 inch nominal dimension, extruded aluminum flush glazed framing system.
- C. Receptor Channel: Model No. 451VG570 and 451VG572, by Kawneer or equivalent for system specified
- D. Finish: Match storefront system.
- E. Member Wall Thickness: Each framing member shall provide structural strength to meet specified performance requirements.

## 2.3 DOORS

- A. Doors: Series 350 swing door, medium stile, by Kawneer. Door sizes indicated on Drawings.
1. Top Rail: 3-1/2 inch, single piece.
  2. Bottom Rail: 10 inch.
  3. Glazing: 1/4 inch thick units per Section 088000, with standard bevel glass stops.
- B. Panic Guard Doors: Use with Series 350 swing door, medium stile, by Kawneer Company, Inc. Door sizes indicated on Drawings.
1. Top Rail: 6-1/2 inch, single piece.
  2. Bottom Rail: 10 inch.

## ALUMINUM-FRAMED STOREFRONTS



3. Glazing: 1/4 inch thick units per Section 088000, with standard bevel glass stops.

## 2.4 HARDWARE

- A. Closers:
  1. Single Acting Doors: Heavy duty, parallel arm only, surface closer meeting ADA-90 requirements, independently hung, with adjustable back check and 100 degree hold-open; slim line half covers, spray painted aluminum to match aluminum storefront system. Attachment: Thru-bolted in door. No drop-plates allowed.
    - a. LCN 4111S-CUSH x TB x 689
- B. Hinges: Continuous aluminum geared hinge, concealed leaf, heavy duty, finish to match door finish. Roton Model 780-112HD as manufactured by Hager or equivalent.
- C. Push: Type CP-2 push by Kawneer Company, Inc. Finish: #14 Black Anodized, or similar by other named Manufacturers. Mount push bar at 42 inches above finish floor.
- D. Pull: Type CO-9 pull by Kawneer Company, Inc. Finish: #14 Black Anodized, or similar by other named Manufacturers.
- E. Door Holder (Exterior doors only): 1221-4 cast iron, finish to match door color, by Trimco - Triangle Brass Mfg. Co.
- F. Weatherstripping (Exterior doors only):
  1. Head and Jamb: Replaceable wool, polypropylene, or nylon wool pile with aluminum strip backing, recessed in frame.
  2. Sill: Semi-rigid polymeric material on aluminum anodized to match door; EPDM sweep strip; 38-560 by Kawneer or similar by other named Manufacturers.
- G. Threshold: See Section 08710.
- H. Crash Chain: (Exterior doors only): CS115 Ives Satin Chrome (US26D), size to be determined through Manufacturer to coordinate with size of storefront door.
- I. Deadbolt Locks: Mortise type, Adams Rite MS-1850A with 4089 exit indicator, less cylinder. See Section 08710 for cylinders and thumbturns.
  1. Install deadbolt lock on single doors.
- J. Hardware Schedule: Provide hardware as scheduled for each exterior entry/exit doors as required under this Section. Coordinate with hardware supplier and prepare door for field installation as required for additional hardware as specified and scheduled in Section 08710.
  1. Continuous Hinge
  2. Closers
  3. Weatherstripping
  4. Drip Cap, overhead, coordinate with Section 08710.
  5. Threshold, coordinate with Section 08710
  6. Push / Pull Sets
  7. Deadbolt Locks, coordinate cylinder with Section 08710.

## 2.5 FABRICATION

- A. Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.
- B. Rigidly fit and secure joints and corners. Make joints and connections flush, hairline, and weatherproof.

- C. Develop drainage holes with moisture pattern to exterior.
- D. Prepare components to receive anchor devices. Fabricate anchorage items. Arrange fasteners, attachments, and jointing to ensure concealment from view.
- E. Prepare components with internal reinforcement for door hardware.
- F. Reinforce framing members for imposed loads.
- G. Accessories:
  - 1. Brake Metal Closures: Minimum 0.040 inch thick aluminum x length required. Finish shall match adjacent related work.
  - 2. Provide clean sharp edges, uniform in appearance and consistent in shape. Secure in place with concealed fasteners where possible. Exposed fasteners shall match enclosure fabrication.
  - 3. Sill Flashing: Fabricate to configuration indicated and required of minimum 0.040 inch aluminum having exposed edges hemmed. Finish shall match adjacent related work.
- H. Hardware: Coordinate with hardware supplier and prepare door for field installation as required for hardware specified and scheduled in Section 087100.

## 2.6 FINISHES

- A. Exposed Aluminum Surfaces: Architectural Class II anodic coating, AA-M12 C22 A31, conforming to AAMA 611. #17 Clear, unless otherwise indicated on Drawings.
- B. Concealed Steel Items: Galvanized in accordance with ASTM A 123 to 2.0 oz/sq ft.
- C. Apply two coats of bituminous paint to concealed aluminum and steel surfaces in contact with cementitious or dissimilar materials.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify wall openings are ready to receive work of this Section. Verify dimensions, tolerances, and method of attachment with other work.
- B. Beginning of installation means acceptance of existing conditions.

### 3.2 INSTALLATION

- A. Install storefront system components in accordance with Manufacturer's instructions.
- B. Use anchorage devices to securely attach frame assembly to structure.
- C. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
- D. Brake Metals:
  - 1. Set sill flashing in full bed of sealant. Provide riveted end laps of not less than 3 inches.
- E. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- F. Install perimeter sealant and backing materials in accordance with Section 07900.

- G. Install glass in accordance with Section 08800, to glazing method required to achieve performance criteria.
- H. Install hardware using templates provided and in accordance with disabled access regulatory requirements for hardware. Refer to Section 08710 for cylinders and installation requirements.
  - 1. Cylinder and Thumb Turn: 48 inches above finished floor.
- I. Set thresholds in bed of mastic and secure.
- J. Adjust operating hardware and crash bars for smooth operation.

### 3.3 TOLERANCES

- A. Variation from Plane: 0.03 inches per foot maximum or 0.25 inches per 30 feet, whichever is less.
- B. Misalignment of Two Adjoining Members Abutting in Plane: 0.015 inches.

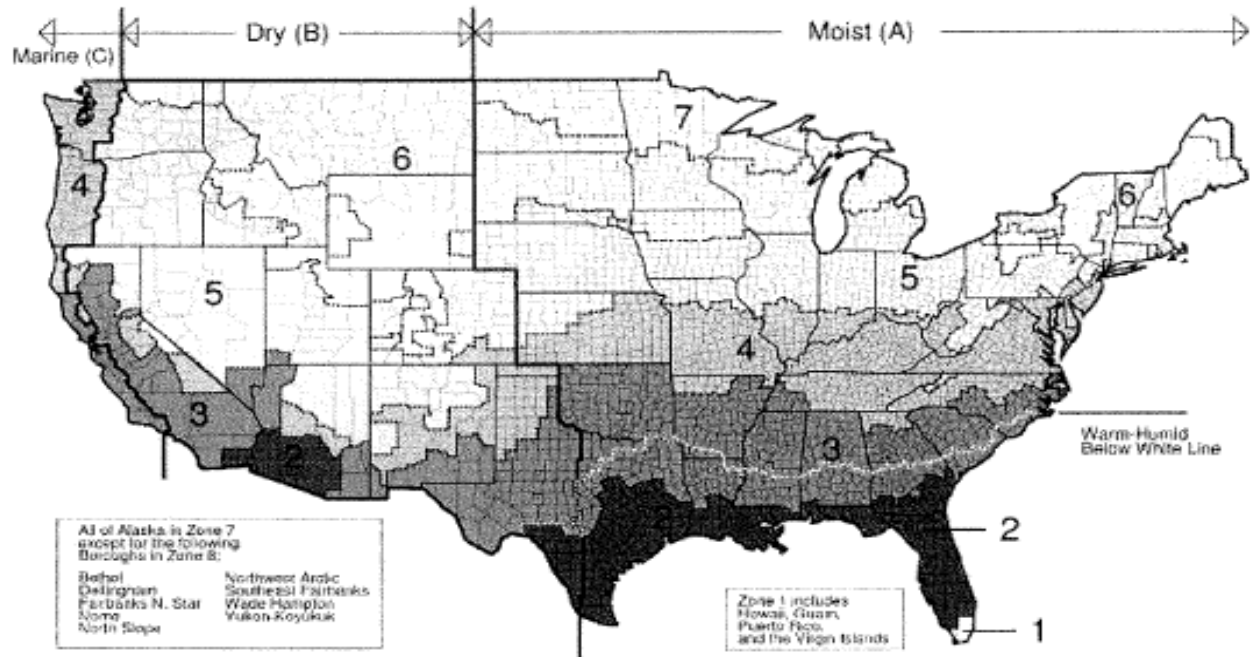
### 3.4 FIELD QUALITY CONTROL

- A. Inspect storefront system installation and attachment to building structure.
- B. Inspect door operation and hardware installation.

### 3.5 CLEANING

- A. Wash down exposed surfaces using a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.
- B. Remove excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant Manufacturer.

END OF SECTION 084313



CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 084313 – ALUMINUM-FRAMED STOREFRONTS

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

## Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the aluminum framed storefronts are installed and are in general conformance with the Contract Documents, applicable Codes, and shop drawings. The aluminum framed storefronts have been provided and placed in operational condition in accordance with the Manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

## ALUMINUM FRAMED STOREFRONT INSTALLER:

\_\_\_\_\_  
(Subcontractor Signature)\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (     ) \_\_\_\_\_

## CONTRACTOR:

\_\_\_\_\_  
(Contractor Signature)\_\_\_\_\_  
(Contractor name and address)

Phone Number: (     ) \_\_\_\_\_



## SECTION 087100 – DOOR HARDWARE – ER

## PART 1 – GENERAL

## 1.1 SUMMARY

- A. Section Includes:
  - 1. Hardware for doors.
  - 2. Thresholds.
  - 3. Weatherstripping, seals and door gaskets.
- B. Related Requirements:
  - 1. Section 016000 – Product Requirements: General procedures related to products.
  - 2. Section 061000 – rough Carpentry: Blocking for miscellaneous hardware mounting.
  - 3. Section 081113 – Hollow metal Doors and Frames: Hardware coordination.
  - 4. Section 084313 – Aluminum-Framed Storefronts: Hardware coordination.
  - 5. Division 26 – Wiring Methods: Electrified hardware coordination.

## 1.2 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.
- B. Americans with Disabilities Act (ADA):
  - 1. 28 CFR part 36 – ADA Standards for Accessible Design.
- C. American National Standards Institute (ANSI):
  - 1. ANSI A 117.1 – Accessible and Useable Building and Facilities.
  - 2. ANSI A 156.2 – Bored and Preassembled Locks and Latches.
  - 3. ANSI A 156.6 – Architectural Door Trim.
  - 4. ANSI A 156.13 – Mortise Locks and Latches
  - 5. ANSI A 156.15 – Release Devices – Closer Holder, Electromagnetic and Electromechanical.
- D. Underwriters Laboratories (UL):
  - 1. UL 305 – Panic Hardware.

## 1.3 SUBMITTALS

- A. Comply with the requirements of Section 013300.

## 1.4 DELIVERY, STORAGE AND HANDLING

- A. Transport, handle, store, and protect the door hardware products in compliance with the requirements of Section 016000 and Manufacturer's recommendations.

- B. Product Packaging: Products will be shipped in Manufacturer's standard packaging with identification markings on each component or package.
- C. Store products in unopened packages in protected dry area to prevent damage from environmental and construction operations.

## PART 2 - PRODUCTS

### 2.1 PRE-NEGOTIATED SUPPLIER

- A. All products in this specification section must be supplied by Bridgestone's National Account Vendor, DH Pace, Inc. No substitutions permitted.
  - 1. DH Pace – 1901 E 119<sup>th</sup> Street, Olathe, KS, 66061 – [BridgestoneDoors@DHPace.com](mailto:BridgestoneDoors@DHPace.com)  
Phone: (417) 831-5585 – National Accounts PM Team
- B. Product Procurement:
  - 1. Unless otherwise noted, products shall be Direct Purchase Products purchased directly by the General contractor through a Pre-Negotiated Supplier Contact.
  - 2. Obtain pricing and purchasing instructions through Pre-Negotiated Supplier Contact.
  - 3. Send purchase orders to Pre-Negotiated Supplier Contact.

### 2.2 MANUFACTURERS

- A. Provide hardware as scheduled in hardware Schedule in part 3 of this Section.
- B. Product Designations: Hardware may be any of the products listed within the tables below for each specific type. Substitutions will not be permitted.
- C. Hardware Manufacturer Designations:

ID	MANUFACTURER	ID	MANUFACTURER
E	Exit Security	F	Falcon (Allegion)
H	Hager Companies	I	H.B. Ives
LCN	LCN Closers	NG	National Guard Products, Inc.
P	Pemko Manufacturing Co.	RO	Rockwood
Sc	Schlage	VD	Von Duprin

### 2.3 REGULATORY REQUIREMENTS

- A. Perform work in accordance with the following standards:
  - 1. ANSI A 117.1
  - 2. NFPA 101.
  - 3. NFPA 80.
  - 4. NFPA 252.



- 5. UL 10B.
- 6. UL 305.

- B. Conform to applicable code for requirements applicable to fire rated doors and frames.
- C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories, Inc. (UL), and acceptable to Authority Having Jurisdiction as suitable for the purpose specified and indicated.
- D. Conform to applicable local, State or Federal disabled access requirements for the installation and operation of door hardware.

## 2.4 FINISHES

- A. Provide finishes as specified in Part 2 of this Section unless otherwise indicated in the Hardware Schedule of the specific hardware item.

## 2.5 EXIT DEVICES

- A. Materials:
  - 1. Provide exposed metal to match hardware.
  - 2. Size and mount units indicated or, if not indicated, to comply with Manufacturer's recommendations for exposure condition. Reinforce substrate as recommended.
- B. **Exit Devices by Manufacturer and Series:**  
Exit devices are UL listed for Panic or Fire Hardware, and are certified to ANSI A156.3, 2001, Grade 1.
  - 1. Von Duprin Series 99
  - 2. Falcon Series 25

## 2.6 HINGES

- A. Material:
  - 1. Mortise Butts: Provide full mortise-type hinges with stainless steel pins, except steel pins with steel hinges; non-removable pin (NRP) for exterior and public interior exposure, non-rising pin, flat button with matching plugs, 4-1/2 inches unless otherwise shown.
  - 2. Ball-bearing Type Hinges: Swaged, inner leaf beveled, square corners.
  - 3. Non-Removable Pin (NRP) hinges on outswing exterior doors.

**B. Hinges by Manufacturer and Series:**

Manufacturer	Interior	Exterior
Hager	ECBB1100	780-112HD X 83" OA X CLEAR
Stanley	FBB179	661HD
Ives	5BB!	112HD

## 2.7 LOCKS, LATCHES, AND BOLTS

### A. Materials:

1. Cylindrical Locks: ANSI A 156.2, Schlage ND Series Grade 1 as scheduled, equipped with 7 pin tumbler Brass Small Format Interchangeable construction cores (SFIC); "keyed alike". Provide 2-3/4 inch backset.
2. Mortise Locks: ANSI A 156.13 Falcon "MA" Series, Operational Grade 1 as scheduled, equipped with 7 pin tumbler Brass Small Format Interchangeable Construction Cores (SFIC); "keyed alike". Provide 2-3/4 inch backset.
3. Provide six construction keys total for the project.
4. Permanent Cores to be provided by hardware supplier, at the conclusion of the project.
5. Owner will maintain control keys for temporary core removal & permanent core installation.
6. Final keying will be coordinated with the Owner.
7. Upon completion of permanent core installation, all keys, including control key, will be turned over to the store manager.
8. Latch Sets: Provide push-button releases by turning lever, closing door, or turning emergency release key through hole in outside knob.
9. Strikes: ANSI Strikes, 1-1/4 x 4-7/8 inches, with curved lip. Wrought box strikes, with extended lip for latch bolts, except open strike plates may be used in wood frames. Provide dustproof strikes for foot bolts.
10. Tactile Warning: Provide locks with tactile warning for handicapped codes when required by Authority Having Jurisdiction.

### B. Locks by Manufacturer and Series:

1. Schlage ND Series
2. Falcon MA Series

## 2.8 CLOSERS

### A. Materials & Features:

1. ANSI A 156.4, grade 1.
2. ADA/ANSI A 117.1.
3. UL listed.
4. Non-handed, non-sized; adjustable 1-5.
5. 180-degree door opening.
6. Standard cover required only on exterior aluminum storefront openings
7. Multiple backcheck location valve.
8. Extreme temperature fluid.
9. Provide exposed metal to match hardware.
10. Size and mount units indicated or, if not indicated, to comply with Manufacturer's recommendations for exposure condition. Reinforce substrate as recommended.
11. 20-year warranty.

**B. Closers by Manufacturer and Series:**

1. LCN 1260 Series
2. Falcon SC80

**2.9 DOOR PROTECTION PLATES**

- A. Materials: J100 Protection Plates conforming to ANSI A 156.6, stainless steel, 0.050" (1.2mm) thickness. Mount centered, flush with bottom of door. Screws: Phillips head sheet metal screws plated to match plate.

**B. Protection Plates by Manufacturer:**

1. Ives
2. Rockwood K1050
3. Trimco K0050

**2.10 STOPS, HOLDERS AND BUMPERS****A. Materials:**

1. Door stop mounting: Methods to suit substrates encountered (plastic anchor, drywall anchor, expansion shield).
2. Provide gray rubber exposed resilient parts.
3. Adjust height of floor stops to suit undercut of adjacent door.

**B. Stops, Holders and Bumpers by Manufacturer:**

1. Hager
2. Rockwood
3. Trimco

**2.11 THRESHOLDS****A. Thresholds by Manufacturer:**

1. National Guard
2. Hager
3. Pemko

**2.12 WEATHERSTRIPPING****A. Weatherstripping by Manufacturer:**

1. National Guard
2. Hager
3. Pemko

## 2.13 MISCELLANEOUS HARDWARE

- A. Silencers: Provide in metal door frames, or unless bumper-type weatherstripping is provided; three for each single door frame, two for double-door frame.
- B. Miscellaneous Hardware by Manufacturer:**
  - 1. National Guard
  - 2. Rockwood
  - 3. Pemko

## 2.14 FABRICATION

- A. Finish and Base Material Designations: Number indicates Builders Hardware Manufacturer's Association (BHMA) Code or nearest traditional U.S. commercial finish.
- B. Where base material and quality of finish are not otherwise indicated, provide at least commercially recognized quality.
- C. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.
  - 1. Spacers or Sex bolts: For through bolting of hollow-metal doors.
  - 2. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

## PART 3 – EXECUTION

### 3.1 EXAMINATION

- A. Verify that doors and frames are ready to receive work and dimensions are as instructed by the Manufacturer.
- B. Verify that electric power is available to power operated devices and of the correct characteristics.

### 3.2 INSTALLATION

- A. Hardware mounting Heights: Door and Hardware Institute Recommended Locations for Builders Hardware for Standard Steel Doors and Frames, except as otherwise indicated.
  - 1. Conform to requirements of applicable local, State or Federal disabled access requirements for the installation and operation of door hardware.

2. Install electromagnetic door holder at 24 inches above finish floor elevation at Manufacturer's recommended distance from the door's leading edge.
- B. Install each hardware item to comply with Manufacturer's instructions and recommendations, unless otherwise specified.
- C. Thresholds: Install as shown on Drawings.

### 3.3 FIELD QUALITY CONTROL

- A. Field quality control shall be the ultimate responsibility of the Contractor in accordance with Section 014000. Field quality control testing and inspection shall be at the discretion of the Contractor as necessary to assure compliance with Contract requirements. Owner site observation specified below shall not preclude Contractor responsibility to perform similar routine, necessary, and customary testing and inspection.

### 3.4 OWNER SITE OBSERVATION

- A. The Owner will perform site observation but only as a means to satisfy the Owner of contract compliance and as assurance to the Owner of Contractor quality control performance.
- B. Owner site observation specified herein below will be performed by a Manufacturer's Technical Representative enlisted by Owner. Site observation will be performed at completion of installation of doors and hardware and will include the following:
  1. Inspect closers; exit devices; locks, latches, and bolts; and electric strikes
  2. Verify hardware installed is as specified.
  3. Verify proper installation.
  4. Verify proper operation.
- C. Manufacturer's Technical Representative will prepare Observation Report and submit to Architect for posting of deficiencies noted on the Owner's Observation Log. Observation Report will indicate the following:
  1. Store number and location.
  2. Time and date of observation.
  3. Name and contact information of Manufacturer's Technical Representative.
  4. Summary of observation.
  5. Identification of deficiencies describing precise door number, hardware item, nature of deficiency, and recommended resolution.
  6. Signature of Manufacturer's Technical Representative.

### 3.5 ADJUSTING

- A. Hardware Adjustment: Adjust hardware for proper operation and function one month after Substantial Completion. Instruct Owners personnel in proper maintenance and adjustment.

### 3.6 HARDWARE SCHEDULE

- A. Hardware Set numbers below correspond to the Door Schedule as shown on the drawings.
- B. Any hardware item specified in the Tables in Part 2 above which corresponds to the mark associated with the item (E.g.: H-1, E-1, etc.) as shown in the Hardware Schedule below may be provided.

## HARDWARE SCHEDULE

**Door 01 – Customer Showroom: Aluminum/Glass Storefront, Single, Single Acting**

1 ea.	Mortise Cylinder.....	80-103 X 138
1 ea.	Construction Core.....	Keyed Brass Construction Core
1 ea.	Thumbturn.....	985T X A02-069
1 ea.	Threshold.....	896V X 36
1 ea.	Drip Strip.....	16A X 40
Finish Selection By Owner		
Balance by Door Manufacturer		

**Door 02 – Customer Showroom: Aluminum/Glass Storefront, Single, Single Acting**

1 ea.	Mortise Cylinder.....	80-103 X 138
1 ea.	Construction Core.....	Keyed Brass Construction Core
1 ea.	Thumbturn.....	985T X A02-069
1 ea.	Threshold.....	896V X 36
Finish Selection By Owner		
Balance by Door Manufacturer		

**Door 03 – Office: HM, Single, Interior**

1-1/2 pr.	Butts.....	5BB1 4-1/2 X 4-1/2
1 ea.	Office Lock.....	ND53BD X RHO X 13-047 X 10-025
1 ea.	Construction Core.....	Keyed Brass Construction Core
1 ea.	Closer.....	1261 X RW/PA X SRT
1 ea.	Silencer.....	608
1 ea.	Kickplates.....	8400 X 10 X 34
1 ea.	Lite Kit.....	L-FRA100 24 W X 32 H
Balance by Door Manufacturer		

**Door 04 – Unisex Toilet: HM, Single, Interior**

1-1/2 pr.	Butts.....	5BB1 4-1/2 X 4-1/2
1 ea.	Privacy Lock.....	ND40S X RHO X 13-048 X 10-025
1 ea.	Closer.....	1261 X RW/PA X SRT
1 ea.	Silencer.....	307D
1 ea.	Wall Stop.....	236W
1 ea.	Sign.....	BF689
Balance by Door Manufacturer		

**Door 05 – Changing Area: Full Height Traffic, Single.**

Balance by Door Manufacturer

**Door 06 – Shop Toilet: HM, Single, Interior**

1-1/2 pr.	Butts.....	5BB1 4-1/2 X 4-1/2
1 ea.	Privacy Lock.....	ND40S X RHO X 13-048 X 10-025
1 ea.	Closer.....	1261 X RW/PA X SRT
1 ea.	Silencer.....	307D
1 ea.	Wall Stop.....	236W
1 ea.	Sign.....	BF689
Balance by Door Manufacturer		

**Door 7 – Service Bay: HM, Single, Exterior**

1 ea.	Continuous Hinge.....	112 HD X 83" US28
1 ea.	Entry Lock.....	MA571B X DG X A3787-1
1 ea.	Construction Core.....	Keyed Brass Construction Core
1 ea.	Closer.....	1261 X RW/PA X SRT
1 ea.	Threshold.....	896V X 36
1 ea.	Perimeter Seal.....	160V
1 ea.	Drip Strip.....	16A X 40
1 ea.	Kickplate.....	8400 X 10 X 34
1 ea.	Lite Kit.....	L-FRA100 7 W X 37 H
Balance by Door Manufacturer		

**Door 8 – Service Bay: Sectional Overhead, Exterior**

Balance by Door Manufacturer

**Door 9 – Service Bay: Sectional Overhead, Exterior**

Balance by Door Manufacturer

**Door 10 – Service Bay: Sectional Overhead, Exterior**

Balance by Door Manufacturer

**Door 11 – Service Bay: Sectional Overhead, Exterior**

Balance by Door Manufacturer

**Door 12 – Service Bay: Sectional Overhead, Exterior**

Balance by Door Manufacturer

**Door 13 – Service Bay: Sectional Overhead, Exterior**

Balance by Door Manufacturer

**Door 14 – Service Bay: Sectional Overhead, Exterior**

Balance by Door Manufacturer

**Door 15 – Service Bay: Sectional Overhead, Exterior**



Balance by Door Manufacturer

**Door 16 – Service Bay: HM, Single, Exterior**

1 ea.	Continuous Hinge.....	112 HD X 83" US28
1 ea.	Exit Lock.....	MA571L X LLL/DG Less Outside Trim / PT#AS5813 X A8737-1
1 ea.	Closer.....	1261 X HCUSH X SRT
1 ea.	Threshold.....	425HD X 48
1 ea.	Perimeter Seal.....	160V
1 ea.	Drip Strip.....	16A X 52
1 ea.	Kickplate.....	K1050 X 10 X 46

Balance by Door Manufacturer

**Door 17 – Fire Riser: HM, Single, Exterior**

1 ea.	Continuous Hinge.....	112 HD X 83" US28
1 ea.	Entry Lock.....	MA571B X DG X A3787-1
1 ea.	Construction Core.....	Keyed Brass Construction Core
1 ea.	Closer.....	1261 X RW/PA X SRT
1 ea.	Threshold.....	896V X 36
1 ea.	Perimeter Seal.....	160V
1 ea.	Drip Strip.....	16A X 40
1 ea.	Kickplate.....	8400 X 10 X 34

Balance by Door Manufacturer

**Keys**

6 ea.	Miscellaneous.....	KB628 X A
1 ea.	Cut Key.....	PCK (Provide Control Key)
5 ea.	Cut Key.....	POK (Provide Operating Key)

**\*\*Emergency Rekey Set of Cores and Keys Duplicating Quantities Above Will Be Provided By DH Pace And Are To Be Placed Into The Safe During Store Turnover By Bridgestone Store Operations\*\***

END OF SECTION 087100

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 087100 – DOOR HARDWARE

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

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

\_\_\_\_\_  
(City & State)

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

Store Number: \_\_\_\_\_

## Statement of Conformance:

This Record Letter of conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the door hardware is installed and is in general conformance with the Contract Documents, applicable Codes, and shop drawings. The door hardware has been provided and placed in operational condition in accordance with the Manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

## DOOR HARDWARE INSTALLER:

\_\_\_\_\_  
(Subcontractor Signature)\_\_\_\_\_  
(Subcontractor Name and Address)

Phone Number: (     ) \_\_\_\_\_

## CONTRACTOR:

\_\_\_\_\_  
(Contractor Signature)\_\_\_\_\_  
Phone Number: (     ) \_\_\_\_\_

## SECTION 088000 – GLAZING

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section Includes:
  - 1. Glass and glazing for interior and exterior metal frames and doors.
- B. Related Requirements:
  - 1. Section 081113 – Hollow Metal Doors and Frames: Glazed doors and fixed window frames.
  - 2. Section 084313 – Aluminum-Framed Storefronts: Aluminum storefront framing system.
  - 3. Section 087100 - Door Hardware: Hardware coordination.

## 1.2 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.
- B. American National Standards Institute (ANSI):
  - 1. ANSI Z97.1 - Safety Performance Specifications and Methods of Test for Safety Glazing Material Used in Buildings.
- C. ASTM International (ASTM):
  - 1. ASTM C 920 - Elastomeric Joint Sealants.
  - 2. ASTM C 1036 - Flat Glass.
  - 3. ASTM C 1048 - Heat-Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass.
  - 4. ASTM D 2000 - Classification System for Rubber Products in Automotive Applications.
  - 5. ASTM E 1886 - Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials.
  - 6. ASTM E 1996 - Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes.
- D. Consumer Product Safety Standards for Architectural Glazing. CPSC 16 CFR, Part 1201.
- E. Flat Glass Marketing Association (FGMA):
  - 1. FGMA - Glazing Manual and Glazing Sealing Systems Manual.

## 1.3 QUALITY ASSURANCE

- A. Conform to FGMA Glazing Manual for glazing installation methods.
- B. Provide permanent labeling for safety glass indicating conformance with specified standards.

## PART 2 - PRODUCTS

## 2.1 GLASS MATERIALS

- A. Glass materials specified herein shall be applicable to the extent as shown in the GLASS SCHEDULE specified hereinafter.
- B. Clear Float Glass: ASTM C1036, Type I (Transparent Glass, Flat), Class 1 (Clear) and Quality q3 (Glazing Select).
  - 1. Thickness: 1/4 inch unless indicated otherwise.

- C. Tempered (Safety) Glass: ASTM C 1048, Kind FT (Fully Tempered), Condition A (Uncoated), Type I (Transparent Glass, Flat), Quality q3 (Glazing Select).
  - 1. Conform to ANSI Z97.1 and CPSC 16CFR Part 1201.
  - 2. Tempered glazing panels as specified in the Glass Schedule below (including doors, sidelights, storefronts, and transoms) shall comply with the CPSC 16CFR Part 1201 criteria for Category I or II as follows:
    - a. Glazing Panels 9 sq. ft. or less: Category I.
    - b. Glazing Panels more than 9 sq. ft.: Category II.
    - c. Thickness:
      - 1) 1/4 inch unless otherwise indicated.
  - 3. Class 1 (Clear) or Class 2
- D. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a 1/2-inch dehydrated interspace, qualified according to ASTM E 2190, and complying with other requirements specified.
  - 1. Clear insulating glass.
    - a. Overall Unit Thickness: 1 inch.
    - b. Thickness of Each Glass Lite: 6.0 mm.
    - c. Outdoor Lite: Fully tempered float glass.
    - d. Interspace Content: Air.
    - e. Indoor Lite: Fully tempered float glass.
    - f. Provide safety glazing labeling.

## 2.2 GLAZING COMPOUNDS

- A. Polysulphide Sealant: Two component, chemical curing, non-sagging type; cured Shore A hardness of 15-25.
- B. Silicone Sealant: Single component, chemical curing; capable of water immersion without loss of properties; non-bleeding, non-staining; cured Shore A hardness of 15-25.
  - 1. Color: Clear.
- C. Acrylic terpolymer compounded especially for glazing; non-hardening, non-staining, and non-bleeding.

## 2.3 GLAZING ACCESSORIES

- A. Setting Blocks: Resilient blocks of 70 to 90 Shore A durometer hardness; compatible with glazing sealant.
- B. Spacers: Resilient blocks of 40 to 50 Shore A durometer hardness; self-adhesive on one side; compatible with glazing sealant.
- C. Filler Rods: Closed cell or jacketed foam rods of polyethylene, butyl, neoprene, polyurethane, or vinyl; compatible with glazing sealant.
- D. Joint Cleaners, Primers, and Sealers: As recommended by glazing sealant Manufacturer.
- E. Gaskets: ASTM D2000, SBC 415 to 3BC 620; extruded or molded neoprene or EPDM, black.

## 2.4 SLIDING WINDOW HARDWARE

- A. Provide sliding window system as noted on drawings.

## 2.5 SUBSTITUTIONS

- A. Comply with the requirements of Section 016000.

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

- A. Verify surfaces of glazing channels or recesses are clean, free of obstructions, and ready for work of this Section.

**3.2 PREPARATION**

- A. Clean contact surfaces; prime or seal where recommended by sealant Manufacturer for intended application.
- B. Inspect glass edges immediately prior to setting; discard those with edge damage that will contribute to glazing failure.

**3.3 GLAZING**

- A. Locate setting blocks at quarter points of sill; set in sealant if heel or toe bead is required.
- B. Install spacers inside and out except where preshimmed tape or glazing gaskets are to be used.
- C. Set each piece in a series to other pieces in pattern draw, bow, or other visually perceptible characteristics.
- D. Provide glazing sealants and gaskets as required for particular glazing application. Coordinate with other Sections for material compatibility.
- E. Gaskets:
  - 1. Provide adequate anchorage, particularly for driven-in wedge gaskets.
  - 2. Miter and weld ends of channel gaskets at corners to provide continuous gaskets.
  - 3. Seal face gaskets at corners with sealant to close opening and prevent withdrawal of gaskets from corners.
- F. Do not leave voids in glazing channels except as specifically indicated or recommended by glass Manufacturer. Force sealant into channel to eliminate voids. Tool exposed surfaces to slight wash away from joint. Trim and clean promptly.
- G. Do not allow sealant to close weeps of aluminum framing.
- H. Provide filler rod where sealants are used in the following locations:
  - 1. Head and jamb channels.
  - 2. Colored glass over 75 united inches in size.
  - 3. Clear glass over 125 united inches in size.

**3.4 SLIDING WINDOW TRACK INSTALLATION**

- A. Provide sliding window system as noted on drawings.

**3.5 ADJUSTING AND CLEANING**

- A. Immediately prior to Owner's acceptance of Project, replace broken or otherwise damaged glass. Wash and polish glass inside and out.

**3.6 GLASS SCHEDULE**

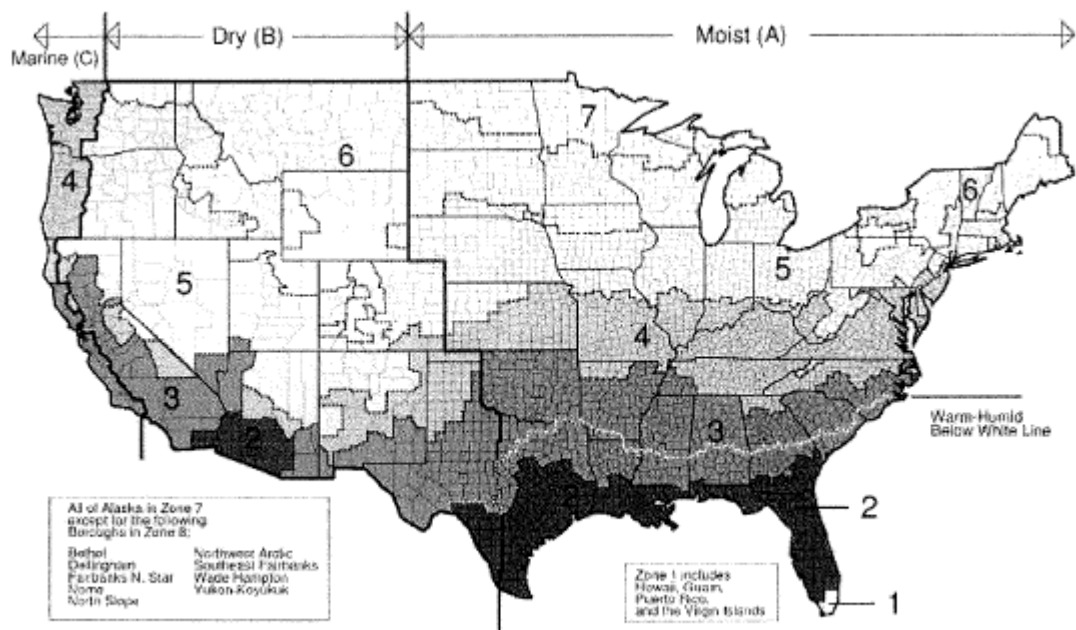
- A. Provide type of glass specified for the applications scheduled as follows:

**GLAZING**

APPLICATION/LOCATION	TYPE OF GLASS
Interior Windows	Clear tempered glass unless otherwise shown or specified
Interior Hollow Metal Doors	Clear tempered glass as scheduled on Drawings.
Interior storefront doors	Clear tempered glass.
Exterior storefront doors and exterior storefront	Clear, insulated, tempered
Interior storefront including storefront doors	Clear tempered glass.
Office window with pass through opening	Clear tempered glass.

END OF SECTION 088000

CLIMATE ZONE MAP



CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 088000 – GLAZING

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

## Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the glazing is installed and is in general conformance with the Contract Documents, applicable Codes, and shop drawings. The glazing has been provided in accordance with the Manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

## GLAZING INSTALLER:

\_\_\_\_\_  
(Subcontractor Signature)\_\_\_\_\_  
(Subcontractor name and address) Phone Number: (    )\_\_\_\_\_

## CONTRACTOR:

\_\_\_\_\_  
(Contractor Signature)\_\_\_\_\_  
(Contractor name and address) Phone Number: (    )\_\_\_\_\_



## SECTION 092900 - GYPSUM BOARD

## PART 1 - GENERAL

## 1.1 SUMMARY

## A. Section Includes:

1. Interior non load-bearing steel stud partition framing (designed for 5 pounds per square foot uniform load perpendicular to partition).
2. Interior gypsum ceilings.
3. Gypsum board.
4. Textured wallboard coating.

## B. Related Requirements:

1. Section 054000 – Cold Formed Metal Framing: Load-bearing steel stud exterior and interior wall framing 20 gage and heavier and ceiling joists. Metal stud header wall framing and bracing supported from roof structure.
2. Section 061000 - Rough Carpentry: Wood furring strips, plywood, blocking, and fasteners attached to partition framing.
3. Section 072100 - Thermal Insulation: Thermal and acoustical insulation.
4. Section 099000 - Painting and Coating: Paint finish applied to gypsum board.

## 1.2 REFERENCES

## A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.

## B. ASTM International (ASTM):

1. ASTM A 653 - Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
2. ASTM C 475 - Joint Compound and Joint Tape for Finishing Gypsum Board.
3. ASTM C 557 - Adhesives for Fastening Gypsum Wallboard to Wood Framing.
4. ASTM C 645 - Nonstructural Steel Framing Members.
5. ASTM C 754 - Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
6. ASTM C 840 - Application And Finishing Of Gypsum Board.
7. ASTM C 954 - Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases to Steel Studs From 0.033 inches to 0.112 inches in Thickness.
8. ASTM C 1002 - Steel Self-Piercing Tapping Screws For The Application Of Gypsum Panel Products Or Metal Plaster Bases To Wood Studs Or Steel Studs.
9. ASTM C 1178 - Coated Glass Mat Water-Resistant Gypsum Backing Panel.
10. ASTM C 1396 - Gypsum Board.
11. ASTM C 1658 - Glass Mat Gypsum Panels.
12. ASTM D 3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
13. ASTM D 3274 - Standard Test Method for Evaluating Degree of Surface Disfigurement of Paint Films by Microbial (Fungal or Algal) Growth or Soil and Dirt Accumulation.

## C. Gypsum Association (GA):

1. GA-214 - Levels of Gypsum Board Finish.
2. GA-216 - Application and Finishing of Gypsum Board.

## D. Steel Framing Industry Association (SFIA):

1. Member listing.

## E. Steel Stud Manufacturer's Association (SSMA):

## GYPSUM BOARD

1. Member listing.

F. Certified Steel Stud Association (CSSA):

1. Member listing.

### 1.3 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in the installation of light gage metal framing components and gypsum wallboard with minimum 5 years documented experience.

### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Transport, handle, store, and protect products in compliance with the requirements of Section 016000.
- B. Protect metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.
- C. Store and protect metal framing with weatherproof covering, and ventilate to avoid condensation.
- D. Deliver materials in original packages, containers, or bundles bearing brand name and identification of Manufacturer or supplier.
- E. Stack gypsum board flat to prevent sagging.

### 1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Establish and maintain environmental conditions for applying and finishing gypsum board in conformance with GA-216.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

## PART 2 - PRODUCTS

### 2.1 FRAMING MATERIALS

- A. Manufacturer: Subject to compliance with requirements, provide products of one of the following:
1. Clark Dietrich Building Systems, West Chester, OH (513) 870-1100.
  2. The Steel Network, Durham, NC (888) 474-4876.
  3. Cemco Steel, Ft. Worth, TX (817) 568-1525.
  4. Telling Industries, LLC Willoughby, OH (866) 372-6384.
  5. Marino/Ware, South Plainfield, NJ (800) 627-4661.
  6. Other Manufacturers listed as a member of CSSA, SSMA or SFIA.
- B. Interior Nonload-Bearing Partition Framing: ASTM C 645 and C 754; galvanized sheet steel, channel shaped, punched for utility access, depth and gages as indicated below unless otherwise indicated on Drawings.
1. Partition having an unbraced length of 12 feet or Less: Minimum 25 gage (18 mil).
  2. Partition having an unbraced length greater than 12 Feet: Minimum 20 gage (30 mil).
  3. Partition height 8 feet and less: Minimum 25 gage (18 mil).
  4. Partition height 8 - 16 feet: Minimum 22 gage (27 mil)
  5. Partition height 16 feet and higher: Minimum 20 gage (30 mil).
- C. Contractor's Option: In lieu of traditional framing members, Contractor may use modified framing members of equivalent thickness for 20 and 25 gage metal such as ProSTUD Drywall Framing System by

Clark Dietrich or comparable framing members by other Manufacturers listed as members of CSSA, SSMA, or SFIA.

- D. Partition Floor Tracks and Runners: ASTM C 645; galvanized sheet steel, channel shaped, same depth and gage as studs, tight fit; solid web.
- E. Deflection (Capture) Track: ASTM C 645; deep-leg U-shaped steel track at roof deck or structure, of web depth as shown to contain studs while allowing free vertical movement indicated.
  - 1. Contractor's Option: One of the following Manufacturer's standard double or single deflection tracks modified as required for web depth as shown:
    - a. VertiClip or VertiTrack by The Steel Network. If this option is used, track may be 20 gauge (30 mil) for all stud sizes.
    - b. FastTop Clip by Clark Dietrich.
    - c. SLP-TRK by Brady Innovations as distributed by Clark Dietrich.
    - d. Comparable modified deflection tracks by other Manufacturers listed as members of CSSA, SSMA, or SFIA.
- F. Furring and Bracing: ASTM C 645; galvanized sheet steel.
  - 1. Studs: ST25 - 2-1/2 inch deep, 25 gage (18 mil).
  - 2. Studs: ST25 - 3-5/8 inch deep, 25 gage (18 mil).
  - 3. Resilient Furring Channels: 1/2 inch deep x 2-1/2 inch wide, 25 gage (18 mil)
  - 4. Hat-Shaped Channels: 7/8 inch deep x 1-1/2 inch wide, 25 gage (18 mil) or 1-1/2 inch deep x 2-1/2 inch wide (30 mil) as shown on the drawings.
  - 5. Cold-Formed Channels: 3/4 x 1/2 inch and 1-1/2 x 17/32 inch, 16 gage (54 mil).
  - 6. Z Furring Channel: 1-1/2 inch deep, 25 gage (18 mil).
  - 7. Clip Angles: 2 inches x 2 inches x 16 gage (54 mil) x 1/4 inch less than stud width.
  - 8. Contractor's Option: In lieu of cold-formed channels and clip angles for horizontal wall bridging, Contractor may provide one of the following:
    - a. Bridge Bar by The Steel Network.
    - b. TradeReady Spazzer 9200 Bridging and Bracing Bar by Clark Dietrich.
    - c. Comparable products by other Manufacturers listed as members of CSSA, SSMA, or SFIA.
- G. Ceiling Joists, Tracks, Headers at Partition Openings, Framing Attachment Angles, and Fasteners: Specified in Section 054000.
- H. Partition Framing Fasteners: Corrosion-resistant self-drilling self-tapping steel screws.
  - 1. 22 Gage (27 mil) Framing: ASTM C 1002; 3/8 inch Type S pan head.
  - 2. 20 Gage (30 mil) and Heavier Framing: ASTM C 954; 5/8 inch Type S-12 low-profile head.
- I. Bracing to Framing Attachment Angle Fasteners: #12 diameter pan head corrosion-resistant self-drilling screws.
- J. Partition Floor Track Anchorage Device: Low velocity powder-actuated drive pins; minimum 0.138 inch shank diameter x 1-1/2 inch shank length with 7/8 inch diameter washer.
  - 1. Hilti PAT System using X-C 37 P8S36 Pins, by Hilti, Tulsa, OK. (800) 879-8000.
  - 2. Ramset/Red Head System using 1500SD Pins, by ITW Ramset/Redhead, Wood Dale, IL (630) 350-0370.
- K. Wall Furring to Masonry Wall Fasteners: Hex head sleeve anchors; minimum 1/4 inch diameter x minimum 1-1/8 inch embedment.
  - 1. Slv Anch HLC-HX 5/16 x 2-5/8, by Hilti, Tulsa, OK (800) 879-8000.
  - 2. Dynabolt HN-1413, by ITW Ramset/Redhead, Wood Dale, IL (708) 350-1558.
- L. Furring Channel to Masonry Surface Fasteners: Low velocity powder-actuated drive pins of size to suit application.
- M. Flat Straps and Plates: ASTM A 653; galvanized sheet steel, gage, shape, and configuration as indicated

on Drawings.

1. Contractor's Option: In lieu of 2-inch continuous metal strap at deflection tracks, Contractor may provide one of the following:
  - a. Bridge Bar by The Steel Network.
  - b. TradeReady Spazzer 9200 Bridging and Bracing Bar by Clark Dietrich.
  - c. Comparable products by other Manufacturers listed as members of CSSA, SSMA, or SFIA.

## 2.2 GYPSUM BOARD MATERIALS

- A. Manufacturers: Subject to specified requirements, provide gypsum board and accessories by the following Manufacturers:
  1. American Gypsum Company, Dallas, TX (800-545-6302)
  2. CertainTeed Corp (Saint-Gobain)., Tampa, FL. (800) 233-8990.
  3. Georgia-Pacific, Atlanta, GA. (800) 284-5347.
  4. National Gypsum Company, Gold Bond Building Products, Charlotte, NC. (800) 628-4662.
  5. The Steel Network, Raleigh, NC (888) 474-4876. (Accessories only)
  6. Clark Dietrich Building Systems, West Chester, OH (513) 870-1100. (Accessories only)
  7. Fry Reglet, (800) 237-9773. (Accessories only)
  8. Other Manufacturers listed as members of CSSA, SSMA, or SFIA.
- B. Standard Gypsum Board: ASTM C 1396.
  1. Thickness: 5/8 inch unless otherwise indicated.
  2. Length, Long Edges, Cut: Maximum permissible length, edges tapered, ends cut square.
  3. Provide one of the following products:
    - a. Gypsum Wallboard by American Gypsum.
    - b. Sheetrock by United States Gypsum.
    - c. CertainTeed Regular Gypsum Board by CertainTeed.
    - d. ToughRock Gypsum Board by Georgia-Pacific.
    - e. Gold Bond Gypsum Board by National Gypsum.
- C. Water Resistant Gypsum Board: ASTM C 1396, Type X.
  1. Thickness: 5/8 inch unless otherwise indicated.
  2. Length, Long Edges, Cut: Maximum permissible length, edges tapered, ends cut square.
  3. Core: Moisture or mold resistant gypsum core.
  4. Mold Resistance: Score of 10 in accordance with ASTM 3273/3274.
  5. Provide one of the following products:
    - a. M-Bloc Mold and Moisture Resistant by American Gypsum.
    - b. Sheetrock Brand Mold Tough by United States Gypsum.
    - c. Gold Bond Brand XP Gypsum Board by National Gypsum.
    - d. ToughRock Mold-Guard Gypsum Board by Georgia-Pacific.
    - e. M2Tech Gypsum Board by CertainTeed.
- D. Gypsum Board Fasteners:
  1. Metal Framing: ASTM C 954 and C 1002, Type S-12 bugle head, corrosion-resistant self-drilling self-tapping steel screws.
    - a. One Layer 1/2 Inch: 1 inch.
    - b. One Layer 5/8 Inch: 1-1/8 inch.
    - c. Two Layers: 5/8 Inch: 1-7/8 inch.
  2. Wood Furring: ASTM C 1002, 1-1/4 inch, Type W bugle head, corrosion-resistant self-drilling steel screws.
- E. Gypsum Board Accessories: Subject to compliance with project requirements and unless otherwise specified, provide the specified gypsum board accessories below or equivalents by one of the Manufacturers listed above:
  1. Corner Beads: Sheetrock Brand No. 104 Dur-A-Bead galvanized steel corner bead by United States Gypsum.
  2. Edge Trim: Galvanized steel casing.

- a. No. 200-B, L shape by United States Gypsum for tight abutment at edges.
  - b. No. 200-A, J shape by United States Gypsum at other locations.
3. Control Joint Accessory Piece: No. 093 roll-formed zinc by Clark Dietrich or by other Manufacturers listed as members of CSSA, SSMA, or SFIA.
4. Vertical Movement Joint Trim: No. DRMZ-625-200 aluminum Z shape trim by Fry Reglet.
5. Adhesive: Commercial adhesive complying with ASTM C 557.
6. Acoustical Insulation: Specified in Section 072100.

## 2.3 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475.
- B. Joint Tape:
  1. Interior Gypsum Wallboard: Paper tape.
- C. Joint Compound:
  1. Interior Gypsum Wallboard:
    - a. Sheetrock Brand Ready-Mixed Lightweight All-Purpose Joint Compound with Dust Control by United States Gypsum.
    - b. ProForm Lite Ready Mix Joint Compound with Dust-Tech by National Gypsum.

## 2.4 TEXTURED FINISHES

- A. Primer: As recommended by textured finish Manufacturer.
- B. Provide textured finish as specified in Publication SA 933 of United States Gypsum, Orange Peel pattern, or equivalent by other wallboard Manufacturers.

## 2.5 SUBSTITUTIONS

- A. Reference Section 016000.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Examine existing conditions and adjacent areas where products will be installed and verify that conditions conform to product Manufacturer's requirements. Verify that building framing components are ready to receive Work. Verify that rough-in utilities are in-place and located where required. Do not proceed until unsatisfactory conditions have been corrected.
- B. Examine panels to assure they are dry and free of moisture and mold damage as evidenced by discoloration, sagging, irregular shape, fuzzy or splotchy surface contamination, and discoloration.

## 3.2 INTERFACE WITH OTHER WORK

- A. Coordinate erection of studs with hollow metal door and window frames, sliding window, and overhead coiling door frames.
- B. Coordinate installation of anchors, supports, and blocking for mechanical, electrical, and building accessory items installed within framing.

## 3.3 INSTALLATION - STEEL FRAMING, GENERAL

- A. Installation Standards: Comply with ASTM C 754, and ASTM C 840 requirements that apply to framing installation and with further details and instruction by gypsum board Manufacturer's written construction

guidelines.

- B. Install supplementary framing, blocking, and bracing at terminations in gypsum board assemblies to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction. Comply with United States Gypsum's "Gypsum Construction Handbook."

### 3.4 INSTALLATION - PARTITION FRAMING

- A. Install studs and fasteners in accordance with Manufacturer's published instructions, ASTM C 754, GA-216, and GA-600.
- B. Install bracing at terminations in assemblies.
- C. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.
- D. Install studs so flanges within framing system point in same direction.
- E. Metal Stud Spacing: Unless otherwise noted, provide interior framing at maximum 24 inches on center. Provide 16 inches on center maximum spacing for walls to receive ceramic tile.
- F. Align stud web openings horizontally.
- G. Splice studs with minimum 8 inch nested lap, fasten each stud flange with minimum two screws.
- H. Construct corners using minimum three studs.
- I. Double stud at wall openings, door and window jambs, maximum 2 inches from each side of openings.
- J. Place studs as indicated on Drawings, minimum 2 inches from abutting walls.
- K. Install headers at partition openings using load-bearing C-shaped joists specified in Section 054000.
- L. Install framing between studs for attachment of mechanical and electrical items.
- M. Install intermediate studs above and below openings to match wall stud spacing.
- N. Install tracks (runners) at floors and overhead supports. Refer to Drawings for indication of partitions extending to finished ceiling only and for partitions extending through ceiling to building structure above.
- O. Maintain clearance under structural members to avoid deflection transfer to studs.
  - 1. Where indicated, construct partition to accommodate vertical deflection.
  - 2. Install optional products by The Steel Network specified in Part 2 above in accordance with Manufacturer's printed instruction.
    - a. Install clip with step bushing in center of slotted hole.
    - b. Use a minimum of two fasteners per clip leg to connect clip to structure and partition framing.
    - c. Attach clip to each stud by screwing through the center of each step bushing.
- P. Fasten studs adjacent to door and window frames, partition intersections, and corners to top and bottom runner flanges in double-stud fashion with metal lock fastener tools.
  - 1. Securely fasten studs to jamb and head anchor clips of door and borrowed-light frames.
  - 2. Place horizontally a cut-to-length section of runner with web-flange bend at each end. Fasten with minimum one screw per flange.
  - 3. Position a cut-to-length stud (extending to top runner) at vertical panel joints over door frame header.

**Q. Lateral Bracing for Metal Studs:**

1. In metal stud partitions and bulkheads where length of metal studs is over 8 feet, install lateral bracing using one of the following methods:
  - a. Install 1-1/2 inch cold-rolled channel through stud web holes and screw attach in place with clip angles. Lap channels by nesting one inside the other to a depth of at least 8 inches and wire tie together.
  - b. Install optional Bridge Bar by the Steel Network specified in Part 2 above in accordance with the Manufacturers printed instructions.
  - c. Install field-cut runner for solid bridging at each end of wall, adjacent to wall openings, and 10 feet on center maximum. Install 1-1/2 inch wide, 20 gage (30 mil) strap bracing on both sides of stud. Fasten strap bracing to each solid bridging runner section with four screws.
2. Gypsum Board Partitions: Space lateral bracing at the following intervals:
  - a. Partitions Greater Than 8 Feet and Up To 12 Feet In Height: Provide bracing at midpoint.
  - b. Partitions Greater Than 12 Feet and Up To 18 Feet In Height: Provide bracing at third points.
  - c. Partitions Greater Than 18 Feet and Up To 24 Feet In Height: Provide bracing at quarter points.

R. Install braced framing of steel stud framing as indicated on Drawings. Use only screw attachments.

S. Blocking: Screw attach wood blocking between studs. Install blocking for support of plumbing fixtures, toilet partitions, wall cabinets, toilet accessories and hardware.

T. Framing Fastening: Fasten framing in accordance with Manufacturer's published instructions and schedule below, unless indicated otherwise on Drawings.

Connection	Fastener
Floor Track to Concrete	1 - Pin at 32 inches on center
Partition Stud to Floor Track	1 - Screw each side at each flange
Stud Brace Web to Stud Web	2 - Screws
Plates and Straps to Studs	2 - Screws
Stud Web to Stud Web	2 - Screws
Stud Brace Web to Attachment Angle	2 - Screws
Lateral Bracing to Partition Stud Using Clip Angles	2 - Screws to stud and 2 - Screws to cold rolled channel
Runner to Header	1 - Screw at 16 inches on center, maximum 6 inches from each end

**3.5 INSTALLATION - FURRING****A. Furring Channels:**

1. Attach vertically spaced at maximum 16 inches on center, to masonry and concrete surfaces with hammer set or powder driven fasteners staggered 24 inches on center on opposite flanges.
2. Nest channels 8 inches at splices and anchor with 2 fasteners in each wing.

**B. Wall Furring:**

1. Secure top and bottom runners to structure.
2. Space metal studs at maximum 16 inches on center.

**3.6 INSTALLATION - ACOUSTICAL ACCESSORIES**

- A. Place acoustical insulation in partitions tight within spaces, around cut openings, behind and around electrical and mechanical items within or behind partitions, and tight to items passing through partitions as specified in Section 072100.

**3.7 INSTALLATION - GYPSUM BOARD****GYPSUM BOARD**

- A. Install gypsum board in accordance with Manufacturer's published instructions, ASTM C 840, GA-216, and GA-600.
  - 1. Use water resistant gypsum board at wet areas including walls and ceiling in toilet rooms, janitor closets as applicable and where shown.
  - 2. Use standard gypsum board at locations not indicated to be water resistant type.
- B. Where applicable, install ceiling panels before the installation of wall panels.
- C. Erect single layer gypsum board in most economical direction in accordance with ASTM C 840, with attachment to firm bearing surfaces over framing members. Do not align panel joints with edges of openings.
- D. Treat cut edges, holes, fastener heads, and joints, including those at angle intersections, in water resistant gypsum board with specified joint compound. Treat prior to installation.
- E. Place gypsum panels over supporting framing members with panel ends aligning and parallel with framing members. Leave bottom edge spacing above floor in accordance with GA-216.
- F. Install fasteners spaced and located in accordance with GA-216 or ASTM C840.

### 3.8 JOINT TREATMENT

- A. Install joint treatment in accordance with GA-216.
- B. Install corner bead, trim, and casing in accordance with GA-216.
- C. Install control joints full height of partition with 1/2 inch gap between board edges and between studs. Apply sealant at base of joint and control joint accessory piece at face. Install control joints at the following locations:
  - 1. Where a wall or partition runs in an uninterrupted straight plane exceeding 30 linear feet.
  - 2. At pairs of doors, install vertical control joint at each jamb. At single doors, install control joint at latch side of jamb. No control joint needed as specified if plywood installed behind the gypsum board.

### 3.9 FINISH

- A. Apply gypsum board finish in accordance with Manufacturer's published instructions and GA-214 finish levels.
- B. Provide gypsum board finish levels at locations as follows:
  - 1. Level 0 (GA-214): No taping, finishing, or accessories necessary.
    - a. Exposed surfaces above 12 ft high.
  - 2. Level 1 (GA-214): Joints and interior angles have tape embedment set in joint compound. Surface free of excess joint compound. Tool Marks and ridges are acceptable.
    - a. Areas above ceilings where required by drawings.
    - b. Concealed areas.
    - c. Interior exposed gypsum surfaces not indicated to be painted.
  - 3. Level 3 (GA-214): Joints and interior angles have tape embedded in joint compound and one additional coat of joint compound applied over all joints and interior angles and two separate coats of joint compound are applied over joints, angles, fastener heads, and accessories. Surface smooth and free of tool marks and ridges.
    - a. Interior gypsum surfaces indicated to be painted.
- C. Textured Coating: Apply textured coating in gypsum board surfaces as scheduled on the drawings.
  - 1. Surface Preparation and Primer: Prepare and apply primer to gypsum panels and other surfaces receiving textured finishes. Apply primer to surfaces that are clean, dry, and smooth.
  - 2. Textured Finish Application: Mix and apply finish using powered spray equipment, to produce a



uniform textured free of starved spots or other evidence of thin application or of application patterns.

3. Prevent textured finishes from coming into contact with surfaces not indicated to receive textured finish by covering them with masking agents, polyethylene film, or other means. If, despite these precautions, textured finishes contact these surfaces, immediately remove droppings and overspray to prevent damage according to textured-finish Manufacturer's written recommendations.

#### 3.10 FIELD QUALITY CONTROL

- A. Inspect metal framing erection, placement, spacing, fasteners, and connections to building.
- B. Inspect gypsum board installation, fastener type, spacing, and finish level.

#### 3.11 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces.
- B. Protect installed interior non load-bearing steel stud partition framing, and gypsum board materials from damage until Substantial Completion.

END OF SECTION 092900

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 092900 – GYPSUM BOARD

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the gypsum board is installed and is in general conformance with the Contract Documents, applicable Codes, and shop drawings. The gypsum board has been provided in accordance with the Manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

GYPSUM BOARD INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (     ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (     ) \_\_\_\_\_

## SECTION 096513 - RESILIENT BASE AND ACCESSORIES

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section Includes:
  - 1. Rubber Resilient Base.
- B. Related Requirements:
  - 1. Section 079200 - Joint Sealants: Sealant between bases and floor or wall surfaces.

## 1.2 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.
- B. ASTM International (ASTM):
  - 1. ASTM E 84 - Surface Burning Characteristics of Building Materials.
  - 2. ASTM F 710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
  - 3. ASTM F1861 – Resilient Wall Base

## 1.3 DELIVERY, STORAGE AND HANDING

- A. Transport, handle, store, and protect products in compliance with the requirements of Section 016000 and Manufacturer's recommendations.
- B. Product Packaging: Deliver in Manufacturer's original packaging with identification markings on each component or package.

## 1.4 SITE CONDITIONS

- A. Environmental Requirements:
  - 1. Store base materials for three days prior to installation in area of installation to achieve temperature stability.
  - 2. Maintain ambient temperature required by adhesive Manufacturer (no less than 72 degrees F for 48 hours) three days prior to, during, and 24 hours after installation of materials.

## PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 1. Roppe Corporation, Fostoria, OH; (419) 435-8546

## 2.2 PRODUCTS

- A. Rubber Resilient Base: ASTM F1861, Type TP (rubber, thermoplastic); 1/8-inch thickness; with matching end stops and preformed corner units:
  - 1. Rubber Cove Wall Base: Model 700 Series, 6" height
    - a. Style: Standard Cove
    - b. Color: Black #100.
  - 2. Adhesive: Water resistant type, VOC less than 50 g/L as recommended by resilient base Manufacturer for application intended.

- B. Trowelable Leveling and Patching Compounds: Latex-modified, Portland cement based, or blended hydraulic-cement-based formulation provided or approved by Manufacturer for applications indicated.
- C. Building Tape: 25 mil polyethylene backed rubberized adhesive membrane tape, BT-25XL Building Tape by Protecto Wrap Co.
- D. Regulatory Requirements: Conform to applicable code for flame/fuel/smoke rating requirements in accordance with ASTM E 84.
- E. Substitutions: Comply with the requirements of Section 016000.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Rubber Resilient Base:
  - 1. Comply with Manufacturer's written instructions for installing resilient base.
  - 2. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.
  - 3. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
  - 4. Do not stretch resilient base during installation.
  - 5. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with Manufacturer's recommended adhesive filler material.
  - 6. Install preformed corners before installing straight pieces.
- B. Building Tape: Install building tape at base of wall behind resilient base or at joints as shown on Drawings. Install in accordance with Manufacturer's instructions.

#### 3.2 CLEANING

- A. Remove excess adhesive from floor, base, and wall surfaces without damage.

END OF SECTION 096513

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 096513 – RESILIENT BASE AND ACCESSORIES

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the resilient base and accessories are installed and are in general conformance with the Contract Documents, applicable Codes, and shop drawings. The resilient base and accessories have been provided in accordance with the Manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

RESILIENT BASE AND ACCESSORY INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address) Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address) Phone Number: (    ) \_\_\_\_\_



## SECTION 099000 - PAINTING AND COATING

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section Includes:
  - 1. Field applied paints and finishes for interior and exterior surfaces.
- B. Related Requirements:
  - 1. Section 017419 – Construction Waste Management and Disposal.
  - 2. Section 092900 - Gypsum Board: Textured Coatings.

## 1.2 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.
- B. ASTM International (ASTM):
  - 1. ASTM E 2129 - Standard Practice for Data Collection for Sustainability Assessment of Building Products.

## 1.3 QUALITY ASSURANCE

- A. Regulatory Requirements:
  - 1. VOC Content: Provide paint and coating materials that conform to Federal, State, and Local restrictions for Volatile Organic Compounds (VOC) content.
  - 2. Toxicity/EQ: Comply with federal, state, and local toxicity and environmental quality regulations and with federal requirements on content of lead, mercury, and heavy metals. Do not use solvents in paint products that contribute to air pollution.
- B. Exterior Coating Applicator Qualifications: Applicator having minimum 5 years documented experience in the application of exterior coatings and approved by coating manufacturer.
- C. Exterior Coating Manufacturer's Technical Representative: A coating Manufacturer's representative shall provide field service at site as required.
- D. Exterior Coating Pre-Installation Conference:
  - 1. Pre-Installation Conference:
    - a. Convene a pre-installation conference at the site, one week prior to commencing Work of this Section.
    - b. Contact Owner's Construction Manager two weeks prior to pre-installation conference to confirm schedule.
    - c. Attendance:
      - 1) Contractor.
      - 2) Coating subcontractor.
      - 3) Coating Manufacturer's technical representative.
    - d. Agenda:
      - 1) Substrate condition including Manufacturer's written approval.
      - 2) Sequence and method of application of coating system.
    - e. Record discussions of conference and decisions and agreements (or disagreements) reached, and affix signatures of all attendees. Furnish copy of record to the Owner's Construction Manager and to each party attending.

## 1.4 DELIVERY, STORAGE AND HANDLING

- A. Transport, handle, store, and protect products in compliance with the requirements of Section 016000.
- B. Delivery of paint materials shall be in sealed original labeled containers, bearing Manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and/or reducing. Notify Supplier when delivered products do not conform to these requirements.

#### 1.5 ENVIRONMENTAL REQUIREMENTS

- A. Apply paint finishes only when moisture content of surfaces is within Manufacturer's acceptable ranges for type of finish being applied.
- B. Minimum surface temperatures or ambient air temperature shall be as follows for the specified coatings unless otherwise specifically stated by the Manufacturer for the specific coating:
  - 1. Alkyd and interior and exterior latex finishes: 50 degrees F.
  - 2. Varnish and transparent finishes: 65 degrees F.
  - 3. All coatings: 5 degrees F above dew point.
- C. Provide continuous ventilation and heating facilities to maintain temperatures above the Manufacturer's stated minimum surface and air temperature for 24 hours prior to, during, and 48 hours after application of interior finishes.
- D. Do not apply paint in areas where dust is being generated.
- E. Provide lighting level in areas being painted of 80-foot candles measured mid-height at substrate surface.
- F. Waste Management:
  - 1. Comply with requirements of Section 017419.
  - 2. Obtain paint in containers of the largest size practical for each color, sheen, and type.
  - 3. Remove excess paint from containers and dispose in accordance with MSDS data and local environmental regulations for paint products.
  - 4. Expose waste paint to air and allow paint to dry.
  - 5. Return reusable drums and totes to Manufacturer.
  - 6. Clean and recycle containers that cannot be returned to Manufacturer.

#### 1.6 EXTERIOR COATING WARRANTY

- A. Contractor shall obtain Intent-to-Warrant statement from Coating Manufacturer prior to coating application.
- B. Submit warranty as part of closeout documents in accordance with Section 017800.
- C. Material: Provide Manufacturer's material warranty, including labor for re-application, to cover:
  - 1. Waterproofing above grade.
  - 2. Bonding.
  - 3. Weathering.
- D. Workmanship: Provide Manufacturer's workmanship warranty to cover labor for deficient workmanship and application.
- E. Warranty Period:
  - 1. Provide 10-year material and workmanship warranty for new unpainted surfaces and 5 year warranty for recoating of previously painted surfaces.
- F. Prepare Application for Limited Warranty included at the end of this Section for submission to exterior paint Manufacturer. Follow instructions on form.



## PART 2 - PRODUCTS

## 2.1 MATERIALS

- A. Manufacturer: Subject to requirements, provide products by the following:
  - 1. Sherwin Williams Company, Atlanta, GA; Contact: Michael Scott, Director of National Accounts, Southeast Division; Telephone: (404) 709-0271; Email: [mike.p.scott@sherwin.com](mailto:mike.p.scott@sherwin.com).
  - 2. Substitutions not allowed.

## PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Examine surfaces and adjacent areas where products will be applied and verify that surfaces conform to product Manufacturer's requirements for substrate conditions. Do not proceed until unsatisfactory conditions have been corrected.
- B. Beginning of application indicates acceptance of substrate conditions.

## 3.2 PREPARATION

- A. Apply paint only on surfaces free of dirt, rust, scale, grease, moisture, scuffed surfaces, and conditions otherwise detrimental to formation of a durable paint film.
- B. Perform preparation and cleaning procedures in accordance with paint Manufacturer's published instructions for each particular substrate condition.
  - 1. Provide barrier coats over incompatible primers or remove and re-prime as required.
  - 2. Remove hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items in place and not to be painted or provide surface applied protection prior to surface preparation and painting operations. Reinstall all removed items after completion of paint work.
  - 3. Clean surfaces to be painted before applying paint or surface treatment. Remove oil and grease prior to mechanical cleaning.
- C. Ferrous Metals: Clean ferrous surfaces that are not galvanized or shop-coated, of oil, grease, dirt, loose mill scale, and other foreign substances by solvent or mechanical cleaning.
  - 1. Touch-up shop-applied prime coats where damaged or bare. Clean and touch-up with same type shop primer.
- D. Galvanized Surfaces: Clean free of oil and surface contaminants with non-petroleum based solvent. Apply coat of etching primer if required by paint Manufacturer.
- E. Cementitious Materials: Prepare cementitious surfaces to be painted by removing efflorescence, chalk, dust, dirt, grease, oils, and by roughening as required to remove glaze.
  - 1. Determine alkalinity and moisture content of surfaces to be painted by performing appropriate tests.
    - a. Alkalinity shall be a maximum Ph of 13 and a minimum of 6.
    - b. If surface alkalinity is outside range specified above, correct condition before application of paint.
    - c. Do not paint over surfaces where moisture content exceeds that permitted in Manufacturer's printed instructions.
  - 2. Clean and etch floor surfaces scheduled to be painted with a commercial solution of muriatic acid, or another etching cleaner. Flush floor with clean water to neutralize acid and allow to dry before painting. Mask floor surfaces not to be cleaned and etched.
    - a. Sealer Removal: Prior to etching, remove curing compound and sealers with strong solvents such as xylene, MEK, toluene or commercial paint strippers or by sandblasting or other similar mechanical action.
- F. Wood: Clean wood surfaces to be painted of dirt, oil, and other foreign substances with scrapers, mineral

spirits, and sandpaper, as required. Sandpaper smooth those finished surfaces exposed to view, and dust off. Scrape and clean small, dry, seasoned knots and apply a thin coat of white shellac or other recommended knot sealer, before application of priming coat. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sandpaper smooth when dried.

1. Prime, stain, or seal wood required to be job-painted immediately upon delivery to job. Prime edges, ends faces, undersides, and backsides of such wood, including cabinets and counters.
2. Seal tops, bottoms, and cut-outs with a heavy coat of varnish or equivalent sealer immediately upon delivery to job.

G. Gypsum Board:

1. Fill minor defects with filler compound. Spot prime defects after repair.

### 3.3 APPLICATION

- A. Apply coating systems specified in the Painting Schedule hereinafter for the corresponding surface. Shop primed surfaces will not require field applied 1st coat (primer) specified in the Painting Schedule.
- B. Apply paint products in accordance with Manufacturer's published instructions using application procedures approved for the particular application and substrate.
- C. Apply each coat to the Dry Film Thickness (DFT) specified which represents the minimum Dry Film Thickness in mils per coat. Apply each coat to uniform coverage.
- D. Apply each coat slightly darker than preceding coat unless otherwise approved by Owner's Construction Manager. Sand smooth surfaces lightly between coats to achieve specified finish.
- E. Allow drying time between coats as recommended by the Manufacturer.
- F. Apply additional coats when undercoats, stains, or other conditions show through final coat until paint film is of uniform finish, color, and appearance. Surfaces, including edges, corners, crevices, welds, and exposed fasteners shall receive minimum dry film thickness equivalent to that of flat surfaces.
- G. Prime Coats: Before application of finish coats, apply a prime coat of material as scheduled or as recommended by Manufacturer to material scheduled to be painted or finished that has not been shop primed. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to assure a finish coat with no burn through or other defects due to insufficient sealing.

### 3.4 MECHANICAL AND ELECTRICAL EQUIPMENT

- A. Replace identification markings on mechanical or electrical equipment when painted over or spattered.
- B. Where exposed piping, conduit, and electrical equipment are to be painted, paint color and texture shall match adjacent surfaces.
- C. Paint both sides and edges of plywood backboards for electrical equipment prior to installation.
- D. Prepaint Gas piping prior to installation. Touch up paint after installation. Colors shall be as follows:
  1. Exterior Piping on Roof (Yellow): P5, OSHA Standard Safety Yellow.
  2. Exposed Interior Piping (Yellow): P5, OSHA Standard Safety Yellow.
  3. Piping in all Other Areas: Color to match adjacent surfaces.

### 3.5 APPLICATION OF EXTERIOR COATINGS

A. General:

1. Concrete masonry unit walls shall have been installed at least 21 days prior to exterior coating application.

2. Begin system application at rear of building and work toward front. Begin system application at top of wall and work down. Begin application of system in the presence of Manufacturer's Technical Representative.
3. Do not paint sealants. Paint wall prior to sealant application in building joints. Protect joints to be sealed by inserting calking backer rods at face of wall.
4. Apply coatings in accordance with Manufacturer's recommendations.
5. Apply cold weather coatings at surface and ambient temperatures at or above manufacturer's recommended application temperatures and rising.

B. Application:

1. Primer:
  - a. Apply primer to masonry surfaces when and as recommended by the Manufacturer as a part of the exterior system. Provide written documentation from Manufacturer if primer coat is or is not required
2. Coating:
  - a. Apply material by brush, roller, plaster type sprayer, or low-pressure sprayer unless recommended by Manufacturer to use brush only. Back roll brushed or sprayed material. Cross roll roller-applied material. Finish material with brush and roller strokes in one direction. For spray application, use airless equipment.
  - b. Apply two coats with a minimum dry film thickness (DFT) as specified in the Painting Schedule.
  - c. Provide pinhole free finish coat.
  - d. Match approved exterior coating field samples for color and sheen.

3.6 FIELD QUALITY CONTROL

- A. Inspect painting and coating application for scheduled material, color, sheen, specified thickness (DFT), and coverage.
- B. Exterior Coatings:
  1. Maintain schedule of application of system in field office for Owner's review.
  2. Manufacturer's Representative Inspection: At completion of application, obtain Manufacturer's Representative (must be same individual present at pre-installation conference) inspection of application and color. Compare application with sample panel. Provide Manufacturer's Representative Report of deficiencies to Contractor and Owner's Construction Manager.
- C. Manufacturer Services:
  1. Post-Installation Site Visit: Upon completion, Manufacturer's Technical Representative shall provide field service including site visit and observation of completed coating system installation.
  2. Prepare inspection report of site visit and submit as a closeout submittal.

3.7 CLEANING

- A. As work proceeds and upon completion, promptly remove paint where spilled, splashed, or spattered.
- B. During progress of work keep premises free from unnecessary accumulation of tools, equipment, surplus materials, and debris.
- C. Collect waste, cloths, and material which may constitute a fire hazard, place in closed metal containers, and remove daily from site.
- D. Upon completion of work, leave premises neat and clean.

3.8 PROTECTION

- A. Protect other surfaces from paint and damage. Repair damage as a result of inadequate or unsuitable protection.

### 3.9 PAINT COLOR SCHEDULE

Provide following colors as applicable as shown or scheduled on the drawings. Refer to sheet A8 for further information.

### 3.10 PAINT SHEEN SCHEDULE

- A. Gloss:
  - 1. Exterior ferrous metal surfaces.
  - 2. Roof hatch (inside and outside surfaces).
  - 3. Exterior pipe bollards.
  - 4. Metal fixed ladders and cages.
- B. Semi-gloss:
  - 1. Exterior hollow metal doors and frames (inside and outside surfaces).
  - 2. Exterior galvanized and non-ferrous metal.
  - 3. Interior hollow metal doors and frames.
  - 4. Wood doors.
  - 5. Concrete masonry units, as indicated.
  - 6. Interior gypsum board walls, as indicated.
- C. Eggshell:
  - 1. All surfaces to be painted where a sheen is not otherwise specified.
  - 2. Concrete masonry units, as indicated.
  - 3. Interior gypsum board walls, as indicated.
  - 4. Interior gypsum board ceilings, as indicated.
- D. Satin:
  - 1. Exterior concrete masonry units.
- E. Flat:
  - 1. Exterior concrete.
  - 2. Interior ferrous metal surfaces.
  - 3. Exposed interior ductwork.
  - 4. Interior gypsum board ceilings, as indicated.
- F. Semi-Transparent Stain:
  - 1. Wood fencing.

### 3.11 ITEMS TO BE PAINTED SCHEDULE

- A. Paint surfaces as shown or scheduled on the drawings including, but not limited to, the following items.
  - 1. Exterior: As indicated on Drawings.
  - 2. Interior: As indicated on Drawings.
- B. Do not paint the following Items:
  - 1. Aluminum, brass, bronze, stainless steel, and chrome plated steel.
  - 2. Pre-finished items, such as mechanical, and electrical equipment or factory finished metal panels and trim.
  - 3. UL, FM, and other code-required labels.
  - 4. Equipment identification, performance rating, and name plates.
  - 5. Finish hardware.

### 3.12 PAINTING SCHEDULE

- A. Apply paint to the substrate surface scheduled as applicable as specified or as shown on the drawings in accordance with the following:

Surface	Sheen	1st Coat	DFT (mils) (per coat)	VOC (g/l)	2nd and 3rd Coats	DFT (mils) (per coat)	VOC (g/l)
EXTERIOR PAINTING SCHEDULE							
Ferrous Metal	Gloss	Pro Industrial ProCryl Universal Primer B66-310	3.0	100	2 Coats: Pro Industrial Zero VOC Enamel, B66-600 Series	4.0	0
Ferrous Metal Over factory painted surface	Gloss	Pro Industrial Zero VOC Enamel, B66-600 Series	4.0	0	1 Coat: Pro Industrial Zero VOC Enamel, B66-600 Series	4.0	0
Ferrous Metal (Satellite dish support and HVAC support framing.	Gloss	Pro Industrial ProCryl Universal Primer B66-310	4.0	100	2 Coats: WB Acrolon 100 Water Based Urethane B65-720, B65V720	2-4	<100
Ferrous Metal (Hollow Metal Doors and Frames)	Semi-gloss	All states except CA: Pro-Cryl Universal Acrylic Primer B66W310. State of CA: Macropoxy 646-100, B58W620, B58V620	2.0-4.0 5.0-10.0	<100 <100	2 coats: Sher-Cryl HPA Semi-Gloss B66-350	2.5-4.0	<200
Galvanized Trim	Semi-gloss	Pro Industrial ProCryl Universal Primer B66-310	3.0	100	2 Coats: Pro Industrial Zero VOC Enamel, B66-600 Series	4.0	0
Nonferrous and Galvanized Metal	Semi-gloss	Pro Industrial ProCryl Universal Primer B66-310	3.0	100	2 Coats: Pro Industrial Zero VOC Enamel, B66-600 Series	4.0	0
Concrete Masonry Unit Exterior (35 degrees F. or above)	Satin	Loxon Block Surfacer A24W200	8.0	81	2 Coats: Superpaint Exterior Latex Satin A89-1100	1.4	<50
Steel Bollards	Gloss	Pro-Cryl Universal Acrylic Primer B66W310	2.0-4.0	<100	1 coat: Sher-Cryl HPA B66-300	2.5-4.0	<200
Wood Fencing	Semi-transparent	SuperDeck Exterior Waterborne Stain SD3T00015	---	<50	SuperDeck Exterior Waterborne Stain SD3T00015	---	<50
INTERIOR PAINTING SCHEDULE							
Ferrous Metal (Dryfall system over steel - overhead structure)	Flat	DTM Acrylic Primer B66W1  Touch up prime welds, bare spots, blemishes, and scratches with Pro Industrial ProCryl Universal Primer B66-310	2.5-5.0	<150	1 Coat: ProIndustrial Waterborne Acrylic Dryfall B42B00081 (Color as noted on drawings)	3.0-4.5	<100

Surface	Sheen	1st Coat	DFT (mils) (per coat)	VOC (g/l)	2nd and 3rd Coats	DFT (mils) (per coat)	VOC (g/l)
Ferrous Metal (Hollow Metal Doors & Frames)	Semi-gloss	All states except CA: Pro-Industrial ProCryl Universal Metal Primer B66-310 Series State of CA: Macropoxy 646-100, B58W620, B58V620	5.0 – 10.0	<100	2 coats: ProClassic Waterborne Interior Acrylic Semi-Gloss B31-1100 Series	1.4	145
Galvanized Metal (Exposed Ductwork)	Flat	Pro Industrial ProCryl Universal Primer B66-310	2	100	1 Coat: ProIndustrial Waterborne Acrylic Dryfall B42B00081 (Color as noted on drawings)	3.0-4.5	<100
Concrete Masonry Unit (All Areas Except Service Bays & Inventory)	Egg-shell	Prep Rite Block Filler B25W25	8	45	2 Coats: ProMar 200 Zero VOC Interior Latex Eg-Shel B20-2600	1.7	<50
Concrete Masonry Unit (Inventory)	Semi-gloss	Prep Rite Block Filler B25W25	8	45	2 Coats: Pro-Industrial Acrylic B66-650		
Concrete Masonry Unit (Service Bays)	Gloss	Heavy Duty Block Filler B42W46	10.0 – 18.0	<50	2 Coats: Pre-Catalyzed Waterbased Epoxy K46-150	2.0 – 4.0	<50
Gypsum Board (Walls) (All Areas Except Inventory and Service Bays)	Egg-shell	ProMar 200 Zero VOC Latex Primer, B28W2600	1.5	0	2 Coats: ProMar 200 Zero VOC Interior Latex Eggshell Enamel, B20-2600 Series	1.7	0
Gypsum Board (Walls) (Inventory)	Semi-gloss	ProMar 200 Zero VOC Latex Primer, B28W2600	1.5	0	2 Coats: Pro-Industrial Acrylic B66-650	2.5 – 4.0	<50
Gypsum Board (Ceilings) (All Areas Except Inventory)	Flat	ProMar 200 Zero VOC Interior Latex Primer, B28W2600	1.5	0	2 Coats: ProMar 400 Zero VOC Interior Latex Flat, B30-4600 Series	1.2	<50

Surface	Sheen	1st Coat	DFT (mils) (per coat)	VOC (g/l)	2nd and 3rd Coats	DFT (mils) (per coat)	VOC (g/l)
and Service Bays)							
Gypsum Board (Ceilings) (Inventory)	Egg-shell	ProMar 200 Zero VOC Interior Latex Primer, B28W2600	1.5	0	1 Coat: Pro-Industrial Acrylic B66-660	2.5 – 4.0	<50
Gypsum Board (Walls) (Service Bays)	Gloss	ProMar 200 Zero VOC Interior Latex Primer, B28W2600	1.5	0	2 Coats: Pre-Catalyzed Waterbased Epoxy K46-150	2.0 – 4.0	<50
Interior Concrete Slabs	Egg-shell	Setfast Acrylic Waterborne Traffic Marking Paint, TM 226/227	8.5	100	1 Coat: Setfast Acrylic Waterborne Traffic Marking Paint, TM 226/227	8.5	100
Wood (Doors & Trim)	Semi-gloss	Premium Wall & Wood Primer B28W8111	1.8	<50	2 Coats: ProClassic Waterborne Interior Acrylic Semi-Gloss B31-1100 Series	1.4	145
Plywood (Walls)	Semi-gloss	ProMar 200 Zero VOC Latex Primer, B28W2600	1.5	0	2 Coats: Pro-Industrial Acrylic B66-650	2.5 – 4.0	<50

END OF SECTION 099000

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 099000 – PAINTING AND COATING

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the painting and coating is applied and is in general conformance with the Contract Documents, applicable Codes, and shop drawings. The painting and coating has been provided and applied in accordance with the Manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

PAINTING AND COATING APPLICATOR:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_



## SECTION 101400 - SIGNAGE

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. This Section includes the following:
  - 1. Door and room signs.

## 1.2 DEFINITIONS

- A. ADA-ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines."
- B. Local and state ordinances that modify or replace federal guidelines.

## 1.3 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with applicable provisions in ADA-ABA Accessibility Guidelines.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

## PART 2 - PRODUCTS

## 2.1 PRE-NEGOTIATED SUPPLIER

- A. Pre-Negotiated Supplier: DH Pace – 1901 E 119<sup>th</sup> Street, Olathe, KS, 66061 – [BridgestoneDoors@DHPace.com](mailto:BridgestoneDoors@DHPace.com). Phone: (417) 831-5585 – National Accounts PM Team

## 2.2 ACCESSORIES

- A. Anchors and Inserts: Provide nonferrous-metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion-bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

## 2.3 SIGNAGE

- A. Braille Signs:
  - 1. Material: Acrylic.
  - 2. Size: 8-inches x 8-inches.
  - 3. Graphics: International symbols for indicated information.
  - 4. Lettering: 5/8-inch high, raised 1/32-inch, with number 2 Braille coding.

5. Color: Selected by Owner's Representative.

B. Accessibility signs:

1. Size: 8-inches x 8-inches.
2. Graphics: International symbols for indicated information.
3. Color: Selected by Owner's Representative.

## 2.4 ACRYLIC SHEET FINISHES

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

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Locate signs and accessories where indicated, using mounting methods of types described and complying with Manufacturer's written instructions.
1. Install signs level, plumb, and at heights indicated, with sign surfaces free of distortion and other defects in appearance.
  2. Interior Wall Signs: Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls. Locate to allow approach within 3 inches of sign without encountering protruding objects or standing within swing of door.
- B. Wall-Mounted Signs: Comply with sign Manufacturer's written instructions except where more stringent requirements apply.
1. Two-Face Tape: Mount signs to smooth, nonporous surfaces. Do not use this method for vinyl-covered or rough surfaces.
  2. Hook-and-Loop Tapes: Mount signs to smooth, nonporous surfaces.
  3. Magnetic Tape: Mount signs to smooth, nonporous surfaces.
  4. Signs Mounted on Glass: Provide matching opaque plate on opposite side of glass to conceal mounting materials.
- C. Dimensional Characters: Mount characters using standard fastening methods to comply with Manufacturer's written instructions for character form, type of mounting, wall construction, and condition of exposure indicated. Provide heavy paper template to establish character spacing and to locate holes for fasteners.
1. Flush Mounting: Mount characters with backs in contact with wall surface.

END OF SECTION 101400

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 101400 – SIGNAGE

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the signage is installed and is in general conformance with the Contract Documents, applicable Codes, and shop drawings. The signage has been provided in accordance with the Manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

SIGNAGE INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_



## SECTION 102813 - TOILET ACCESSORIES

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section Includes: Toilet accessories and attachment hardware.
- B. Related Requirements:
  - 1. Section 016000 - Product Requirements: General procedures related to products.
  - 2. Section 061000 - Rough Carpentry: Blocking for attachment of accessories.

## 1.2 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.
- B. ANSI International (ANSI):
  - 1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.

## 1.3 DELIVERY, STORAGE, AND HANDLING

- A. Owner Furnished Accessories Installed by Contractor: Include in Contract Amount costs incurred for receiving, storage, and labor of Owner furnished product to be installed by the Contractor. Contractor shall assume costs for replacement materials reshipped due to loss or damage on job site after acceptance of original shipment.
- B. Coordinate release of products for delivery to site with contacts specified herein.

## PART 2 - PRODUCTS

## 2.1 PRE-NEGOTIATED SUPPLIER

- A. Pre-Negotiated Supplier: Specialties Direct, Inc., Chicago, IL.
  - 1. Contacts:
    - a. John Zalecki,
      - 1) Phone: (630) 323-8100, ext 5802.
      - 2) Email: [jzalecki@specialtiesdirect.com](mailto:jzalecki@specialtiesdirect.com).
    - b. Brian Dormer
      - 1) Email: [bdomer@specialtiesdirect.com](mailto:bdomer@specialtiesdirect.com)
- B. Product Procurement:
  - 1. Unless otherwise noted, accessories shall be Direct Purchase Products purchased directly by the General Contractor through a Pre-Negotiated Supplier specified above in accordance with requirements specified in Section 016000.
  - 2. Obtain unit pricing and purchasing instructions through Pre-Negotiated Supplier Contact.
  - 3. Send purchase orders to Pre-Negotiated Supplier contact.

## 2.2 OWNER FURNISHED PRODUCTS

- A. Owner will furnish the following accessory for installation by the Contractor:
  - 1. Coat Rack per F1 Sheet.

## 2.3 MATERIALS

## TOILET ACCESSORIES

- A. Stainless Steel: AISI Type 302/304.
- B. Mounting Devices: Hot-dip galvanized after fabrication or of same material as accessory unit.
- C. Adhesive: Epoxy type contact cement.
- D. Finishes:
  - 1. Chrome/Nickel Plating: Polished finish.
  - 2. Stainless Steel: No. 4 satin finish, unless specified otherwise.
  - 3. Shop Primed Ferrous Metals: Pretreat and clean, spray apply one coat primer and bake.

## 2.4 FABRICATION

- A. Weld and grind smooth joints of fabricated components.
- B. Form exposed surfaces from one sheet of stock, free of joints. Form surfaces flat without distortion. Maintain flat surfaces without scratches or dents.
- C. Provide steel anchor plates and anchor components for installation on building finishes. Hot-dip galvanize ferrous metal anchors and fastening devices.
- D. Back paint components where contact is made with building finishes to prevent electrolysis.
- E. Shop-assemble components and package complete with anchors and fittings.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Deliver inserts and rough-in frames to Site at appropriate time for building-in. Use templates and rough-in measurements as required.
- B. Verify that blocking is appropriately installed and ready to receive accessories.
- C. Rough Wall Openings: Provide rough wall opening (RWO) in compliance with ADA Accessibility Guidelines, as detailed on architectural drawings, and as described in the Schedule of Accessories.

### 3.2 INSTALLATION

- A. Install fixtures, accessories, and items in accordance with Manufacturer's instructions and as shown on Drawings. Install accessories within toilet rooms and install accessories and soap dispensers in other areas in addition to toilet rooms where shown on Drawings. Use tamper-proof fasteners.
- B. Install true, plumb, and level, securely and rigidly anchored to wall framing.

### 3.3 SCHEDULE OF ACCESSORIES

- A. Sanitary Napkin Disposal: Direct purchase through Pre-Negotiated Supplier.
  - 1. Surface mounted, stainless steel.
    - a. Model No. 0473-A, by American Specialties, Inc.
- B. Paper Towel Dispensers, Semi-recessed: Direct purchase through Pre-Negotiated Supplier.
  - 1. Paper Towel Cabinet and Waste Receptacle, stainless steel.
    - a. Model 0469-2, by American Specialties, Inc.
      - 1) Rough Wall Opening: 15 3/4" W x 54-1/2" H x 2" D.

- C. Toilet Paper Dispensers, Double-Roll: Direct purchase through Pre-Negotiated Supplier.
  - 1. Heavy duty cast aluminum with satin finish.
    - a. Model No. 0264-1A, by American Specialties, Inc.
- D. Diaper Changing Table: Direct purchase through Pre-Negotiated Supplier.
  - 1. Horizontal Polyethylene Diaper Changing Station – Wall Mounted
    - a. Model No. 9012, by American Specialties Inc
    - b. Color: Light Gray
- E. Coat Hook: Model 0745-Z, by American Specialties, Inc.
- F. Framed Mirrors: Direct purchase through Pre-Negotiated Supplier.
  - 1. Fixed Angle Tilted Mirror, with tempered glass. Mitered 20-gauge stainless steel frame. Mirror size shall be 18 x 36 unless otherwise shown.
    - a. Model No. 0535, by American Specialties Inc
- G. Grab Bars: Direct purchase through Pre-Negotiated Supplier.
  - 1. 20-gauge stainless steel; 1-1/4 inch diameter, (1-1/2 inch diameter where required by Local Code) textured grip surface; concealed mounting consisting of welded-on mounting flange with snap-on cover flange or escutcheon. Location, quantity, and length shall be as shown.
    - a. Model No. 3700 P, by American Specialties.

#### 3.4 CLEANING

- A. Protection and Cleaning of Toilet Accessories and Attachment Hardware Prior to Possession.
  - 1. Immediately prior to possession, clean stainless-steel accessories and attachment hardware thoroughly using soap, ammonia, or mild detergent and water. Apply with sponge or soft cloth, rinse with clear water and wipe dry. Always rub in the direction of polish lines. Rinse thoroughly with fresh water after every cleaning operation. Clean and polish to a spotless luster. Wipe dry to avoid water marks.
  - 2. Clean and polish stainless steel accessories and mirror surfaces to a spotless luster.

END OF SECTION 102813

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 102813 – TOILET ACCESSORIES

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the toilet accessories are installed and are in general conformance with the Contract Documents, applicable Codes, and shop drawings. The toilet accessories have been provided and placed in operational condition in accordance with the Manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

TOILET ACCESSORY INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_



## SECTION 104000 – SAFETY SPECIALTIES

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section Includes:
  - 1. Lock box key vault for fire department emergency building access.

## 1.2 QUALITY ASSURANCE

- A. Pre-Installation Meetings: Meet with fire department to determine requirements for lock box type and coordinate exact location for installation and mounting of box on building.

## PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

- A. Fire Department Lock Box:
  - 1. Knox Box by The Knox Company, Phoenix, AZ., Phone: (800) 552-5669.
  - 2. Alternate Manufacturers: As approved by fire department.

## 2.2 MANUFACTURED UNITS

- A. Fire Department Lock Box:
  - 1. UL labeled, weather resistant, factory finished, heavy duty steel lock box.
  - 2. Model: Type and size as required by fire department.
  - 3. Ordering: Complete Manufacturer's Authorization/Order Form and obtain local fire department authorized signature on form before processing.

## PART 3 - EXECUTION

## 3.1 INSTALLATION

- A. Install fire department lock box at location required by fire department in accordance with Manufacturer's published instructions.

END OF SECTION 104000

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 104000 – SAFETY SPECIALTIES

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

## Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the safety specialties are installed and are in general conformance with the Contract Documents, applicable Codes, and shop drawings. The safety specialties have been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

## SAFETY SPECIALTY INSTALLER:

\_\_\_\_\_  
(Subcontractor Signature)\_\_\_\_\_  
(Subcontractor name and address) Phone Number: (    ) \_\_\_\_\_

## CONTRACTOR:

\_\_\_\_\_  
(Contractor Signature)\_\_\_\_\_  
(Contractor name and address) Phone Number: (    ) \_\_\_\_\_

## SECTION 105113 – METAL LOCKERS

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section Includes:
  - 1. Standard duty metal lockers.

## 1.2 DELIVER, STORAGE, AND HANDLING

- A. Do not deliver metal lockers until spaces to receive them are clean, dry, and ready for their installation.

## 1.3 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of work specified in other Sections to ensure that metal lockers can be supported and installed as indicated.

## PART 2 - PRODUCTS

## 2.1 PRE-NEGOTIATED SUPPLIER

- A. Pre-Negotiated Supplier: Specialties Direct, Inc., Chicago, IL.
  - 1. Contacts:
    - a. John Zalecki,
      - 1) Phone: (630) 323-8100, ext. 5802.
      - 2) Email: [jzalecki@specialtiesdirect.com](mailto:jzalecki@specialtiesdirect.com).
    - b. Brian Dormer
      - 1) Email: [bdormer@specialtiesdirect.com](mailto:bdormer@specialtiesdirect.com)
- B. Product Procurement:
  - 1. Units shall be Direct Purchase Products purchased directly by the General Contractor through a Pre-Negotiated Supplier specified above in accordance with requirements specified in Section 016000.
  - 2. Obtain unit pricing and purchasing instructions through Pre-Negotiated Supplier Contact.
  - 3. Send purchase orders to Pre-Negotiated Supplier contact.

## 2.2 STANDARD DUTY METAL LOCKERS

- A. Basis-of-Design Products: Subject to compliance with requirements, provide comparable products by the following:
  - 1. Double Tier Traditional Collection, by ASI Storage Solutions.
    - a. Doors: 16-gauge steel, with louvers for ventilation channel shaped on both the lock and hinge side, with angle formations across top and bottom.
    - b. Body Bottom: 16-gauge steel.
    - c. Tops, Sides, Backs: 24-gauge steel.
    - d. Hinges: Full length 16-gauge continuous piano type riveted to both door and frame.
    - e. Latching:
      - 1) Lifting Trigger: Steel, attached to the latching channel. Trigger shall have a padlock eye for use with padlock eye.
    - f. Interior Equipment:
      - 1) Wall Hooks: Three.
      - 2) Ceiling Rod: One.
    - g. Color Exposed and Non-Exposed Body Parts: Manufacturer's standard #25 Gray.

- h. Assembly: All locker components shall be assembled by use of rivets. All associated bolts and pieces shall be powder coated to match locker color

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. General: Install level, plumb, and true; shim as required, using concealed shims.
  - 1. Anchor locker runs at ends and at intervals recommended by Manufacturer, but not more than 36 inches o.c. Using concealed fasteners, install anchors through backup reinforcing plates, channels, or blocking as required to prevent metal distortion.
  - 2. Anchor single rows of metal lockers to walls near top and bottom of lockers, and to floor.
- B. Equipment and Accessories: Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.
  - 1. Attach hooks with at least two fasteners.
  - 2. Attach door locks on doors using security-type fasteners.
  - 3. Identification Plates: Identify metal lockers with identification plates.
    - a. Attach plates to each locker door, near top, centered, with at least two aluminum rivets.

### 3.2 ADJUSTING, CLEANING, AND PROTECTION

- A. Clean, lubricate, and adjust hardware. Adjust doors and latches to operate easily without binding.
- B. Protect metal lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit use during construction.
- C. Touch up marred finishes or replace metal lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker Manufacturer.

END OF SECTION 105113

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 105113 – METAL LOCKERS

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

## Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the metal lockers are installed and are in general conformance with the Contract Documents, applicable Codes, and shop drawings. The metal lockers have been provided and placed in operational condition in accordance with the Manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

## METAL LOCKER INSTALLER:

\_\_\_\_\_  
(Subcontractor Signature)\_\_\_\_\_  
(Subcontractor name and address) Phone Number: (    ) \_\_\_\_\_

## CONTRACTOR:

\_\_\_\_\_  
(Contractor Signature)\_\_\_\_\_  
(Contractor name and address) Phone Number: (    ) \_\_\_\_\_



## SECTION 107313 – CANVAS AWNINGS

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section Includes:
  - 1. Fixed awning with extruded-aluminum frame and fabric cover.
- B. Related Requirements as required per Project Manual:
  - 1. Section 042200 – Concrete Unit Masonry: Substrate for awning.
  - 2. Section 079200 - Joint Sealants: Installation of sealant at frame perimeter.

## 1.2 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.
- B. Aluminum Association, Inc.:
  - 1. Aluminum Design Manual.
  - 2. Aluminum Structures: A Guide to Their Specifications and Design.
- C. ASTM International (ASTM):
  - 1. ASTM D 1187 - Asphalt-Base Emulsions for Use as Protective Coatings for Metal.
  - 2. ASTM D 3451 - Standard Guide for Testing Coating Powders and Powder Coatings.
  - 3. ASTM E 84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
- D. American Welding Society (AWS):
  - 1. Standard D1.2 - Structural Welding Code - Aluminum.

## 1.3 QUALITY ASSURANCE

- A. Contractor to schedule for 10-12-week lead time.

## PART 2 - PRODUCTS

## 2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide awnings capable of withstanding the effects of gravity loads and wind loads, as indicated on the Structural Drawings, resulting in a uniform pressure acting inward or outward without permanent deformation of framework or permanent damage to fasteners and anchors.

## 2.2 MANUFACTURERS

- A. Subject to compliance with project requirements, provide products by one of the following:
  - 1. B & C Awnings, Inc., Anaheim, CA, (800) 962-9949. Contact: Christopher Walker; Email: [christopher@bcawnings.com](mailto:christopher@bcawnings.com).
  - 2. Substitutions not allowed.

## 2.3 PRODUCTS

- A. Description: Fixed awning with extruded-aluminum frame and fabric cover:
  - 1. Model: F034, by B & C Awnings.
  - 2. Configuration: Size and shape as shown on Drawings.

3. Frame: Fixed, extruded aluminum, consisting of horizontal tubes supported on rectangular aluminum tube frames.
4. Awning Fabric: Vinyl laminated 100% polyester, nominal 17.5 oz. per square yard, ASTM E-84, Class A.
  - a. Patio 500, by B&C Awnings.
  - b. Finish: Matte.
  - c. Color: 522 Beige.

- B. Aluminum Frames: Fabricate from extruded aluminum (Alloy 6061-T6 or 6063-T5) of sufficient thickness and design configuration to resist design loads.
  1. Finish: Powder-coat finish per ASTM D 3451, complying with finish Manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.
    - a. Color: Black.
- C. Anchors, Fasteners, Fittings, Hardware, and Installation Accessories: Comply with performance requirements indicated and suitable for exposure conditions, supporting structure, anchoring substrates, and installation methods indicated. Provide components of corrosion-resistant or non-corrodible, weather-resistant, compatible, non-staining materials. Provide as required for awning assembly, mounting, and secure attachment.
  1. Finish and color shall be same, or compatible with, awning frame.
- D. Provide supports, anchorage, and accessories required for complete assembly.
- E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

## 2.4 SUBSTITUTIONS

- A. Comply with the requirements of Section 016000.

## 2.5 FABRICATION

- A. Pre-assemble awning frames in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- B. Mechanically assemble and fasten to the outriggers, tubes, or tube connections, with the use of mechanical attachment. Spot or continuous weld as necessary where mechanical fastening of parts is prohibitive or unacceptable. Grind smooth perimeter welds.
- C. Connection Design:
  1. Maintain minimum edge distance and hole spacing in accordance with the Aluminum Association Specifications for Aluminum Structures. In no case shall a joint be designed or manufactured with edge distance smaller than 1.5x diameter.
  2. Design and fabricate perimeter support, if welded, in accordance with Aluminum Association Aluminum Design Manual and AWS Standard D1.2.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Verify that supports to receive awnings are clean, flat, level, plumb, square, accurately aligned, and correctly located.
- B. Prevent contact between aluminum and dissimilar materials by the use of stainless-steel shims, elastomeric gaskets, and/or non-metallic bearing pads.



### 3.2 INSTALLATION

- A. Install awnings per Manufacturer's written instructions and as indicated on Drawings.
- B. Locate and place awnings level, plumb, and at indicated alignment with adjacent work.
- C. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.
- D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers as indicated.
- E. Repair damaged finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory. Make required alterations and refinish entire unit or provide new units.
- F. Protect galvanized and non-ferrous metal surfaces from corrosion or galvanic action by applying a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.

END OF SECTION 107313

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 107313 – AWNINGS

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

## Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the awnings are installed and are in general conformance with the Contract Documents, applicable Codes, and shop drawings. The awnings have been provided and placed in operational condition in accordance with the Manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

## AWNING INSTALLER:

\_\_\_\_\_  
(Subcontractor Signature)\_\_\_\_\_  
(Subcontractor name and address) Phone Number: (    ) \_\_\_\_\_

## CONTRACTOR:

\_\_\_\_\_  
(Contractor Signature)\_\_\_\_\_  
(Contractor name and address) Phone Number: (    ) \_\_\_\_\_

## SECTION 108213 - ROOF TOP EQUIPMENT SCREENS

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section Includes:
  - 1. Pre-formed thermoplastic panel for enclosing roof top mechanical equipment.
  - 2. Aluminum assembly framing for direct attachment of screening panels to mechanical equipment; no base or curb required unless shown otherwise on drawings.
  - 3. Sliding panels to permit easy access to mechanical equipment for servicing.
- B. Products Not Installed or Furnished in This Section:
  - 1. Touch-up painting required for scratches and screw heads.
  - 2. Field painting of prime painted screens
- C. Related Sections:
  - 1. Refer to Alternates, Section 01 23 00 [01230], for direction regarding bidding of equipment screens as alternates.

## 1.2 REFERENCES

- A. American Society for Testing and Materials: Standard Specifications for
  - 1. ASTM B 221-96 - Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire Profiles, and Tubes.
- B. The Aluminum Association, Inc.
  - 1. AA ADM-1516166 (1994) - Aluminum Design Manual
- C. American Society of Civil Engineers.
  - 1. ASCE 7-95 - Minimum Design Loads for Buildings and Other Structures.

## 1.3 SYSTEM DESCRIPTION

- A. Design Criteria:
  - 1. Manufacturer is responsible for the structural design of all materials, assembly and attachments to resist snow, wind, suction and uplift loading at any point without damage or permanent set.
  - 2. Framing shall be designed in accordance with the Aluminum Design Manual to resist the following loading:
    - a. ASCE 7-95 - Minimum Design Loads for Buildings and Other Structures; American Society of Civil Engineers.

## 1.4 SUBMITTALS

- A. Product Data: Submit Manufacturer's catalog data, detail sheets, specification and other data sufficient to indicate compliance with these specifications.
- B. Shop Drawings: Indicate layouts heights, component connection details, and details of interface with adjacent construction. Mark data to indicate:
  - 1. Roof top mechanical equipment to be enclosed.
- C. Samples:
  - 1. Samples of Materials: thermoplastic
  - 2. Color Selection: Alabaster.

- D. Certification: Manufacturer's Certificate of Compliance certifying that thermoplastic panels supplied meet or exceed requirements specified.
- E. Closeout Submittals: Warranty documents, issued and executed by Manufacturer, countersigned by Contractor.

#### 1.5 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with requirements of building authorities having jurisdiction in Project location.
- B. Manufacturer Qualifications: Minimum five (5) years documented experience producing systems specified in this section.
- C. Pre-Installation Meeting:
  - 1. Convene at job site seven (7) calendar days prior to scheduled beginning of construction activities of this section to review requirements of this section.
  - 2. Require attendance by representatives of the installing subcontractor, (who will represent the system Manufacturer) and other entities directly affected by construction activities of this section.
  - 3. Notify Architect four (4) calendar days in advance of scheduled meeting date.

#### 1.6 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 and Handling: Protect materials and finishes during handling and installation to prevent damage.

#### 1.7 PROJECT CONDITIONS

- A. Field Measurements: Take measurements of actual roof top unit for fit without gaps. Indicate measurements on shop drawings fully documenting any field condition that may interfere with the screen system installation.

#### 1.8 COORDINATION

- A. Installer for work under this Section shall be responsible for coordination of panel and framing sizes and required options with the Contractor's requirements.
  - 1. Request information on sizes and options required from the Contractor.
- B. Submit shop drawings to the Contractor and obtain written approval of shop drawing from the Contractor prior to fabrication.

#### 1.9 WARRANTY

- A. If any part of the rooftop equipment screen fails because of a manufacturing defect within one year from the date of substantial completion, the Manufacturer will furnish without charge the required replacement part(s). Any local transportation, related service labor or diagnostic call charges are not included.
- B. This warranty does not cover failure of your rooftop equipment screen if it is damaged by the Owner, or if the failure is caused by improper installation. In no event shall Warrantor be liable for incidental or consequential damages.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Acceptable Products: Enviro Screening System by CityScapes Incorporated, 4200 Lyman Ct. Hilliard, OH 43026. 1-877-727-3367 [www.cityscapesinc.com](http://www.cityscapesinc.com)
- B. Substitutions: no substitutions allowed.

### 2.2 MATERIALS

- A. Thermoformed Plastic Panels: Fabricated from rigid medium impact thermo-formed ABS (Acrylic Butylene Styrene) sheets.
  - 1. Minimum thickness: 3/16 inch (5 mm).
- B. Painted Metal Panels: Fabricated from rigid aluminum panels in multiple thicknesses.
  - 1. Minimum thickness: 0.063
- C. Perforated Metal Panels: Fabricated from rigid [aluminum] [steel] panels in multiple thicknesses.
  - 1. Minimum thickness: 0.063
- D. Framing: Aluminum Plate, Shapes and Bar: ASTM B 221, alloy 6061-T5 or 6063-T5.
- E. Threaded Fasteners: All screws, bolts, nut and washers shall be Stainless steel.
  - 1. Corner assembly fasteners shall be #10-16 x stainless steel TEK screws. Length as required to develop full holding capacity of screw when fastened to Mechanical Equipment.
  - 2. Provide lock washer or other locking device at all bolted connections.

### 2.3 FABRICATION

- A. Provide factory-formed panel systems with continuous interlocking panel connections and indicated or necessary components: Form all components true to shape, accurate in size, square and free from distortion or defects. Cut panels to precise lengths indicated on approved shop drawings.
- B. Fabricate all panels to slide horizontally to allow access to unit access panels behind.
- C. Panel Design, Style, Trim:
  - 1. Panel Style: Vertical
  - 2. Panel Design: AcryliCap: Batten
  - 3. Decorative Top Trim Profile: Band
- D. Trim and Closures: Fabricated from 24 gage metal, and finished with the Manufacturers standard coating system, unless shown otherwise on drawings.
- E. Framing: Fabricate and assemble components in largest practical sizes, for delivery to the site.
  - 1. Construct corner assemblies to required shape with joints tightly fitted.
  - 2. Supply components required for anchorage of framing. Fabricate anchors and related components of material and finish as required, or as specifically noted.

### 2.4 FINISHES

- A. Aluminum Framing: Mill finish.
- B. Panel Coating: Manufacturer's standard coating system, factory applied.
  - 1. Color: Selected from full range of Manufacturer's standard colors.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Installer's Examination: Examine conditions under which construction activities of this section are to be performed.
  - 1. Submit written notification to Architect and Screen Manufacturer if such conditions are unacceptable.
  - 2. Beginning erection constitutes installer's acceptance of conditions.

#### 3.2 INSTALLATION

- A. Install units in accordance with the Manufacturer's instructions and approved shop drawings. Keep perimeter lines straight, plumb, and level. Provide brackets, anchors, and accessories necessary for a complete installation.
- B. Fasten structural supports to HVAC units without damaging operation of the unit.
  - 1. Provide corner and mid-span assemblies as required by approved shop drawings so that the panels are supported uniformly.
  - 2. Fastening bottom rail using bolts to permit ease of access to HVAC units.
- C. Insert thermoplastic panels into structural supports, except where fixed attachment points are indicated. Butt thermoplastic panels to adjacent panels for uniform fit. Fasten fixed panels in accordance with the shop drawings.
- D. Metal Separation: Where aluminum materials would contact dissimilar materials, insert rubber grommets at attachment points, thus eliminating where dissimilar metals would otherwise be in contact.
- E. Do not cut or abrade finishes which cannot be restored. Return items with such finishes to shop for required alterations.

#### 3.3 ERECTION TOLERANCES

- A. Maximum misalignment from true position: ¼ inch (6 mm).

#### 3.4 CLEANING AND PROTECTION

- A. Remove all protective masking from material immediately after installation.
- B. Protection:
  - 1. Ensure that finishes and structure of installed systems are not damaged by subsequent construction activities.
  - 2. If minor damage to finishes occurs, repair damage in accordance with Manufacturer's recommendations; provide replacement components if repaired finishes are unacceptable to Architect.
- C. Prior to Substantial Completion: Remove dust or other foreign matter from component surfaces; clean finishes in accordance with Manufacturer's instructions.
  - 1. Clean units in accordance with the Manufacturer's instructions.

END OF SECTION 108213

## SECTION 133419 - METAL BUILDING SYSTEMS

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section Includes:
  - 1. Metal roof panels.
  - 2. Metal wall panels.
  - 3. Accessories.

## 1.2 PRE-INSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference at the project site.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of metal building system component.
- B. Shop Drawings: Indicate components by others. Include full building plan, elevations, sections, details and attachments to other work.
- C. Samples: For units with factory-applied finishes.
- D. Delegated-Design Submittal: For metal building systems.
  - 1. Include analysis data indicating compliance with performance requirements and design data signed and sealed by the qualified professional engineer responsible for their preparation.

## 1.4 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Letter of Design Certification: Signed and sealed by a qualified professional engineer. Include the following:
  - 1. Name and location of Project.
  - 2. Order number.
  - 3. Name of Manufacturer.
  - 4. Name of Contractor.
  - 5. Building dimensions including width, length, height, and roof slope.
  - 6. Indicate compliance with AISC standards for hot-rolled steel and AISI standards for cold-rolled steel, including edition dates of each standard.
  - 7. Governing building code and year of edition.
  - 8. Design Loads: Include dead load, roof live load, collateral loads, roof snow load, deflection, wind loads/speeds and exposure, seismic design category or effective peak velocity-related acceleration/peak acceleration, and auxiliary loads (cranes).

9. Load Combinations: Indicate that loads were applied acting simultaneously with concentrated loads, according to governing building code.
10. Building-Use Category: Indicate category of building use and its effect on load importance factors.

- C. Material test reports.
- D. Source quality-control reports.
- E. Field quality-control reports.
- F. Sample warranties.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance data.

#### 1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified Manufacturer.
  1. Accreditation: Manufacturer's facility accredited according to the International Accreditation Service's AC472, "Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems."
  2. Engineering Responsibility: Preparation of comprehensive engineering analysis and Shop Drawings by a professional engineer who is legally qualified to practice in jurisdiction where Project is located.
- B. Erector Qualifications: An experienced erector who specializes in erecting and installing work similar in material, design, and extent to that indicated for this Project and who is acceptable to Manufacturer.
- C. Welding Qualifications: Qualify procedures and personnel according to the following:
  1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
  2. AWS D1.3, "Structural Welding Code - Sheet Steel."

#### 1.7 WARRANTY

- A. Special Warranty on Metal Panel Finishes: Manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
  1. Finish Warranty Period: 25 years from date of Substantial Completion.
- B. Special Weathertightness Warranty for Standing-Seam Metal Roof Panels: Manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that leak or otherwise fail to remain weathertight within specified warranty period.
  1. Warranty Period: 20 years from date of Substantial Completion.



## PART 2 - EXECUTION

## 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements and to the extent specified hereinafter, provide products by the below Manufacturer:
  - 1. Nucor Building Systems – 704.366.7000
  - 2. Varco Pruden Buildings – 205.907.8176
  - 3. Inland Buildings – 256.739.6827
- B. Substitutions: Substitutions are not allowed.

## 2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Manufacturer shall engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design metal building system.
- B. Structural Performance: Metal building systems shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated according to procedures in MBMA's "Metal Building Systems Manual."
  - 1. Design Loads: As indicated on Drawings.
  - 2. Deflection and Drift Limits: As indicated on Drawings.
- C. Seismic Performance: Metal building system shall withstand the effects of earthquake motions determined as indicated on Drawings.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
  - 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- E. Structural Performance for Metal Roof and Wall Panels: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:
  - 1. Wind Loads: As indicated on Drawings.
- F. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.
  - 1. Uplift Rating: UL 60.

## 2.3 ACCESSORIES

- A. General: Provide accessories as standard with metal building system Manufacturer and as specified. Fabricate and finish accessories at the factory to greatest extent possible, by Manufacturer's standard procedures and processes. Comply with indicated profiles and with dimensional and structural requirements.

1. Form exposed sheet metal accessories that are without excessive oil-canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
- B. Roof Panel Accessories: Provide components required for a complete metal roof panel assembly including copings, fasciae, corner units, ridge closures, clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels unless otherwise indicated.
- C. Wall Panel Accessories: Provide components required for a complete metal wall panel assembly including copings, fasciae, mullions, sills, corner units, clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal wall panels unless otherwise indicated.
- D. Flashing and Trim: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.018-inch nominal uncoated steel thickness, pre-painted with coil coating; finished to match adjacent metal panels.
- E. Gutters: Provided as shown on drawings.
- F. Roof Curbs: Provided as shown on drawings
- G. Pipe Flashing: Provided as shown on drawings.

## 2.4 FABRICATION

- A. General: Design components and field connections required for erection to permit easy assembly.
  1. Mark each piece and part of the assembly to correspond with previously prepared erection drawings, diagrams, and instruction manuals.
  2. Fabricate structural framing to produce clean, smooth cuts and bends. Punch holes of proper size, shape, and location. Members shall be free of cracks, tears, and ruptures.
- B. Tolerances: Comply with MBMA's "Metal Building Systems Manual" for fabrication and erection tolerances.
- C. Primary Framing: Shop fabricate framing components to indicated size and section, with baseplates, bearing plates, stiffeners, and other items required for erection welded into place. Cut, form, punch, drill, and weld framing for bolted field assembly.
- D. Secondary Framing: Shop fabricate framing components to indicated size and section by roll forming or break forming, with baseplates, bearing plates, stiffeners, and other plates required for erection welded into place. Cut, form, punch, drill, and weld secondary framing for bolted field connections to primary framing.
- E. Metal Panels: Fabricate and finish metal panels at the factory to greatest extent possible, by Manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements. Comply with indicated profiles and with dimensional and structural requirements.
  1. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of metal panel.

## PART 3 - PART 3 EXECUTION

## 3.1 ERECTION OF STRUCTURAL FRAMING

- A. Erect metal building system according to Manufacturer's written instructions and drawings.
- B. Do not field cut, drill, or alter structural members without written approval from metal building system Manufacturer's professional engineer.
- C. Set structural framing accurately in locations and to elevations indicated, according to AISC specifications referenced in this Section. Maintain structural stability of frame during erection.
- D. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials and roughen surfaces prior to setting plates. Clean bottom surface of plates.
  - 1. Set plates for structural members on wedges, shims, or setting nuts as required.
  - 2. Tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
  - 3. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with Manufacturer's written installation instructions for shrinkage-resistant grouts.
- E. Align and adjust structural framing before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with framing. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
  - 1. Level and plumb individual members of structure.
  - 2. Make allowances for difference between temperature at time of erection and mean temperature when structure will be completed and in service.
- F. Primary Framing and End Walls: Erect framing level, plumb, rigid, secure, and true to line. Level baseplates to a true even plane with full bearing to supporting structures, set with double-nutted anchor bolts. Use grout to obtain uniform bearing and to maintain a level base-line elevation. Moist-cure grout for not less than seven days after placement.
  - 1. Make field connections using high-strength bolts installed according to RCSC's "Specification for Structural Joints Using High-Strength Bolts" for bolt type and joint type specified.
    - a. Joint Type: Snug tightened or pretensioned as required by Manufacturer.
- G. Secondary Framing: Erect framing level, plumb, rigid, secure, and true to line. Field bolt secondary framing to clips attached to primary framing.
  - 1. Provide rake or gable purlins with tight-fitting closure channels and fasciae.
  - 2. Locate and space wall girts to suit openings such as doors and windows.
  - 3. Provide supplemental framing at entire perimeter of openings, including doors, windows, ventilators, and other penetrations of roof and walls.
- H. Bracing: Install bracing in roof and sidewalls where indicated on erection drawings.
  - 1. Tighten rod and cable bracing to avoid sag.
  - 2. Locate interior end-bay bracing only where indicated.

- I. Framing for Openings: Provide shapes of proper design and size to reinforce openings and to carry loads and vibrations imposed, including equipment furnished under mechanical and electrical work. Securely attach to structural framing.
- J. Erection Tolerances: Maintain erection tolerances of structural framing within AISC 303.

### 3.2 METAL PANEL INSTALLATION, GENERAL

- A. General: Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
  - 1. Field cut metal panels as required for doors, windows, and other openings. Cut openings as small as possible, neatly to size required, and without damage to adjacent metal panel finishes.
    - a. Field cutting of metal panels by torch is not permitted unless approved in writing by Manufacturer.
  - 2. Install metal panels perpendicular to structural supports unless otherwise indicated.
  - 3. Flash and seal metal panels with weather closures at perimeter of openings and similar elements. Fasten with self-tapping screws.
  - 4. Locate and space fastenings in uniform vertical and horizontal alignment.
  - 5. Locate metal panel splices over structural supports with end laps in alignment.
  - 6. Lap metal flashing over metal panels to allow moisture to run over and off the material.
- B. Lap-Seam Metal Panels: Install screw fasteners using power tools with controlled torque adjusted to compress EPDM washers tightly without damage to washers, screw threads, or metal panels. Install screws in predrilled holes.
  - 1. Arrange and nest side-lap joints so prevailing winds blow over, not into, lapped joints. Lap ribbed or fluted sheets one full rib corrugation. Apply metal panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.
- C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal roof panel Manufacturer.
- D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal panel assemblies. Provide types of gaskets, fillers, and sealants indicated; or, if not indicated, provide types recommended by metal panel Manufacturer.
  - 1. Seal metal panel end laps with double beads of tape or sealant the full width of panel. Seal side joints where recommended by metal panel Manufacturer.

### 3.3 METAL ROOF PANEL INSTALLATION

- A. General: Provide metal roof panels of full length from eave to ridge unless otherwise indicated or restricted by shipping limitations.
  - 1. Install ridge caps as metal roof panel work proceeds.

2. Flash and seal metal roof panels with weather closures at eaves and rakes. Fasten with self-tapping screws.
- B. Standing-Seam Metal Roof Panels: Fasten metal roof panels to supports with concealed clips at each standing-seam joint, at location and spacing and with fasteners recommended by Manufacturer.
1. Install clips to supports with self-drilling or self-tapping fasteners.
  2. Install pressure plates at locations indicated in Manufacturer's written installation instructions.
  3. Snap Joint: Nest standing seams and fasten together by interlocking and completely engaging factory-applied sealant.
  4. Seamed Joint: Crimp standing seams with Manufacturer-approved motorized seamer tool so that clip, metal roof panel, and factory-applied sealant are completely engaged.
  5. Rigidly fasten eave end of metal roof panels and allow ridge end free movement for thermal expansion and contraction. Pre-drill panels for fasteners.
  6. Provide metal closures at rake edges, rake walls and each side of ridge caps.
- C. Lap-Seam Metal Roof Panels: Fasten metal roof panels to supports with exposed fasteners at each lapped joint, at location and spacing recommended by Manufacturer.
1. Provide metal-backed sealing washers under heads of exposed fasteners bearing on weather side of metal roof panels.
  2. Provide sealant tape at lapped joints of metal roof panels and between panels and protruding equipment, vents, and accessories.
  3. Apply a continuous ribbon of sealant tape to weather-side surface of fastenings on end laps and on side laps of nesting-type metal panels, on side laps of ribbed or fluted metal panels, and elsewhere as needed to make metal panels weatherproof to driving rains.
  4. At metal panel splices, nest panels with minimum 6-inch (152-mm) end lap, sealed with butyl-rubber sealant and fastened together by interlocking clamping plates.
- D. Metal Fascia Panels: Align bottom of metal panels and fasten with blind rivets, bolts, or self-drilling or self-tapping screws. Flash and seal metal panels with weather closures where fasciae meet soffits, along lower panel edges, and at perimeter of all openings.

### 3.4 METAL WALL PANEL INSTALLATION

- A. General: Install metal wall panels in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts, extending full height of building, unless otherwise indicated. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.
1. Unless otherwise indicated, begin metal panel installation at corners with center of rib lined up with line of framing.
  2. Shim or otherwise plumb substrates receiving metal wall panels.
  3. When two rows of metal panels are required, lap panels 4 inches minimum.
  4. When building height requires two rows of metal panels at gable ends, align lap of gable panels over metal wall panels at eave height.
  5. Rigidly fasten base end of metal wall panels and allow eave end free movement for thermal expansion and contraction. Pre-drill panels.
  6. Flash and seal metal wall panels with weather closures at eaves and rakes, and at perimeter of all openings. Fasten with self-tapping screws.
  7. Install screw fasteners in pre-drilled holes.
  8. Install flashing and trim as metal wall panel work proceeds.

9. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated on Drawings; if not indicated, as necessary for waterproofing.
  10. Align bottom of metal wall panels and fasten with blind rivets, bolts, or self-drilling or self-tapping screws.
  11. Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.
- B. Metal Wall Panels: Install metal wall panels on exterior side of girts. Attach metal wall panels to supports with fasteners as recommended by Manufacturer.

### 3.5 ACCESSORY INSTALLATION

- A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.
1. Install components required for a complete metal roof panel assembly, including trim, copings, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
  2. Install components for a complete metal wall panel assembly, including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
  3. Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by Manufacturer.
- B. Flashing and Trim: Comply with performance requirements, Manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible and set units true to line and level. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
1. Install exposed flashing and trim that is without excessive oil-canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
  2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).
- C. Gutters: Join sections with riveted-and-soldered or lapped-and-sealed joints. Attach gutters to eave with gutter hangers spaced as required for gutter size, but not more than 36 inches o.c. using Manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.
- D. Roof Curbs: Install curbs at locations indicated on Drawings. Install flashing around bases where they meet metal roof panels.
- E. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to panel as recommended by Manufacturer.

3.6 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform field quality control special inspections and to submit reports.
- B. Product will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

END OF SECTION 133419





## SECTION 211313 - WET PIPE SPRINKLER SYSTEMS

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Furnish all labor, materials, tools, equipment and related items required for the complete design and installation of automatic sprinkler system.
- C. All areas of the building shall be protected by wet automatic fire sprinklers. The system shall be hydraulically calculated. Density shall be in accordance with NFPA 13 unless special circumstances such as stacking heights or materials to be stored cause other chapters of the NFPA to be required. Follow those chapters for the appropriate sprinkler requirements.

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Pipes, fittings, and specialties.
  - 2. Hangers and Sleeves.
  - 3. Backflow Prevention.
  - 4. Fire protection valves:
    - a. Electronically supervised indicating control valves.
    - b. Check valves.
    - c. Globe valves.
    - d. Ball valves.
    - e. Angle valves.
  - 5. Test connections, main drains and auxiliary drains.
  - 6. Fire department connections.
  - 7. Sprinklers.
  - 8. Alarm devices.
  - 9. Pressure gages.
  - 10. Signs.
  - 11. Corrosion Management Products.

## 1.3 DESCRIPTION OF WORK

- A. Provide all required labor, materials, equipment, testing and services necessary for a complete and operational wet pipe fire protection system for the building as hereinafter described and as shown on the engineering drawings.
- B. Work shall begin at the flange located at the spigot inside the building and shall include the following:
  - 1. Wet pipe fire sprinkler system for the entire building.

2. Coordination of work and schedules with other trades.

- C. It is intended that the engineering drawings and specification shall describe and provide for a working installation complete in every detail and all items necessary for such complete installation shall be provided whether or not specifically mentioned herein or shown on the engineering drawings.

#### 1.4 DEFINITIONS

- A. Standard Pressure Sprinkler Piping: Listed for 175 psi minimum working pressure.

#### 1.5 SYSTEM DESCRIPTION

- A. FIRE SPRINKLER SYSTEM DESIGN CRITERIA SHALL BE STRICTLY PER THIS SPECIFICATION.
- B. Fire sprinkler system to provide fire protection for the entire building.
- C. Interface fire sprinkler system with building fire and smoke alarm systems.
- D. OFFICE AREAS, BREAKROOM, TOILETS (Light Hazard wet pipe fire sprinkler system):
- Density - 0.10 gpm/sq ft
  - Operating Area - 1,500 sq ft
  - OFFICE AREAS, BREAKROOMS: Standard Coverage Spacing  
Temperature Classification / Nominal K-factor / Response Type - INT / 5.6 / QR
  - TOILET: Standard Coverage Spacing  
Temperature Classification / Nominal K-factor / Response Type - ORD / 5.6 / QR
  - Hose Stream Allowance - 100 gpm
  - Duration - 0.5 hour
- E. CUSTOMER SHOWROOM (Ordinary Group II Wet Pipe Fire Sprinkler System):
- Density – 0.20 gpm/sq ft
  - Operating Area – 1,500 sq ft
  - Temperature Classification / Nominal K-factor / Response Type - INT / 5.6 / QR
  - Hose Stream Allowance - 250 gpm
  - Duration - 1.0 hour
- F. MECHANICAL BAYS, INVENTORY AND USED INVENTORY (15 psi) ESFR wet pipe fire sprinkler system:
- Minimum end head pressure – 15 psi

- Minimum number of sprinklers calculated - Twelve (12) hydraulically most remote sprinklers, four (4) per branch line.
- Temperature Classification / Nominal K-factor / Sprinkler Type - INT / 25.2 / ESFR
- Hose Stream Allowance - 250 gpm
- Duration - 1.0 hour

NOTE: This design criteria will protect tire storage on tread up 15 ft in up to 20 ft building.

G. SPRINKLER SPACING SHALL BE AS SHOWN ON THE ENGINEERING DRAWINGS.

1. Acoustical Tile - Locate sprinklers in accordance with the engineering drawings. Not more than a 3 in. (76 mm) radius tolerance about the point identified by dimension will be accepted. Where rows of sprinklers are provided within the same ceiling plane, any part of the tolerance used for one sprinkler shall be the same for all others in that same row.
2. Hard Ceilings - Locate sprinklers in accordance with the engineering drawings. Sprinklers shall be in line with light fixtures and other sprinklers where indicated on the drawings. Coordinate closely with the electrical contractor.
3. Unfinished Areas - Locate sprinklers as shown on the engineering drawings.

H. Provide fire department connection as indicated on the engineering drawings.

I. Provide all necessary offsets, raises or drops in main or branch line piping and auxiliary drains required by building conditions whether or not shown on the engineering drawings.

J. Examine the job conditions and verify all measurements, distances, elevations, clearances, pipe sizes, etc.

K. It is understood, unless specifically indicated otherwise, that the pipe sizes as shown on the engineering drawings will be used.

1.6 PERFORMANCE REQUIREMENTS

A. Standard Pressure Piping System Component: Listed for 175 psi minimum working pressure.

B. Water Supply:

Fire protection water supply has been obtained from a hydrant flow test performed on 11/07/2019 by Lee's Summit Water Utility. The water supply shall be considered effective at the base of the static/residual hydrant. The approximate water supply elevation is 1,012 ft AMSL or 4 ft below finish floor. No substitutions of water supply data or its effective point will be allowed.

Actual Static: 78 psi  
Actual Residual: 50 psi  
Actual Flow: 1,775 gpm

The above water supply coordinates do not include the required 10% of the static pressure safety factor that shall be enforced. The following water supply coordinates have been adjusted -8 psi for the required safety factor.

Design Static: 70 psi  
Design Residual: 42 psi  
Design Flow: 1,775 gpm

## 1.7 SUBMITTALS

- A. The engineering drawings have been prepared using AutoCAD. The hydraulic calculations have been prepared using HydraCALC. These documents will be made available to the successful fire sprinkler contractor in either electronic form or hard copy. Utilization of these documents for the development of shop drawings and submittals does not relieve the fire sprinkler contractor from any of his responsibilities required herein.
- B. Submittals shall be in accordance with requirements of the General Conditions of the Contract.
- C. Product Literature: For all wet pipe sprinkler system equipment.
  - 1. Literature shall clearly identify exactly what components are being provided and shall include: finish, size, type, etc. Literature which is not clearly identified will be rejected.
- D. Shop Drawings:
  - 1. Drawings must be comprehensive of entire project, demonstrating coordination with other disciplines, complete in all detail and the same scale as the engineering drawings.
  - 2. Hydraulic calculations (calculations shall include peaking information).
- E. Field Test Reports and Certificates: Indicate test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping."
- F. Field quality control reports.
- G. CCI will review this submittal for consistency with CCI's Construction Documents.
- H. After the satisfactory review by CCI, provide submittals to the Authority Having Jurisdiction (AHJ) and the insurance underwriter for approval.
- I. The fire sprinkler contractor shall be responsible for responding, in writing, to any comments from the AHJ or the insurance underwriter within ten (10) working days after the receipt of their comments. Copies of the response shall be sent to the General Contractor and CCI.
- J. Provide as-built documents in accordance with requirements of the General Conditions of the Contract.
- K. Provide operating and maintenance instructions to the Owner in accordance with requirements of the General Conditions of the Contract and NFPA 13.

## 1.8 QUALITY ASSURANCE

- A. Installer Qualifications:

1. Installer's responsibilities include preparing shop drawing submittal, fabricating, and installing sprinkler systems. Base calculations on water supply coordinates provided herein.
  - a. Installer shall be State and Locally Licensed.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. References: Fire sprinkler system equipment, specialties, accessories, installation, and testing shall comply with all applicable codes and referenced design standards:
  1. 2018 International Building Code
  2. 2018 International Fire Code
  3. NFPA 13, Sprinkler Systems – 2016 Edition.
- D. Equipment and components shall be UL Listed for fire protection systems installation.
- E. All fire sprinkler system components shall be installed free of any rust, corrosion or visible damage. All items not complying with this requirement shall be replaced without cost to the Owner.

#### 1.9 COORDINATION

- A. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.
- B. Coordinate installation of system with all other disciplines.

#### 1.10 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
- B. Provide at the riser one (1) twelve (12) head spare sprinkler cabinets stocked with sprinklers and escutcheon assemblies proportionate to those provided in the building and all necessary sprinkler wrenches as required by NFPA 13.

#### 1.11 REGULATORY REQUIREMENTS

- A. All work shall meet the requirements of Section 1.8.
- B. The fire sprinkler contractor shall not pursue any approvals or interpretations of CCI's Construction Documents except through CCI.
- C. Sprinkler piping shall not be concealed where it is inaccessible unless it is first inspected and accepted by a representative of the authority having jurisdiction.
- D. Any work performed prior to the satisfactory review by CCI and approval by the authority having jurisdiction and the insurance underwriter, will be solely at the fire sprinkler contractor's risk.

- E. The system will not be acceptable until final testing and receipt of the Contractor's Material and Test Certificate has been obtained.

#### 1.12 WARRANTY

- A. Repair all defective workmanship or replace all defective materials for a period of one year from the date of acceptance by the Owner. Workmanship or equipment found to be defective during that period shall be replaced without cost to the Owner.

### PART 2 - PRODUCTS

#### 2.1 PIPE AND FITTINGS

- A. Per local requirements and NFPA 13. All pipe shall have a Corrosion Resistance Ratio (CRR) equal to or greater than 1.00. Refer to the current UL Fire Protection Equipment Directory - Steel Sprinkler Pipe for acceptable manufacturers, sizes, and joining methods.
- B. THE ENGINEER'S HYDRAULIC CALCULATIONS ANTICIPATES THAT ALL GROOVED WET PIPE SYSTEM RISERS, FEED AND CROSS MAINS, AND BRANCH LINES SHALL HAVE HYDRAULIC CHARACTERISTICS EQUAL TO OR GREATER THAN SCHEDULE 10 PIPE.
- C. ALL THREADED PIPING SHALL BE SCHEDULE 40 PIPE.
- D. ALL 1 IN. SHALL BE SCHEDULE 40 PIPE.
- E. Fittings shall be screwed or flanged black cast iron or approved equal such as mechanical, grooved or welded connections.
- F. Pressure Rating: 175 psi minimum.

#### 2.2 JOINING OF PIPE AND FITTINGS

- A. All pipe shall be joined in accordance with NFPA 13 and manufacturers recommendations.
- B. Where GROOVED FITTINGS AND COUPLINGS are used together they shall be of the same manufacturer.
- C. BUSHINGS SHALL NOT BE USED.
- D. Flexible couplings shall be identified on the Shop Drawings.

#### 2.3 HANGERS

- A. All hangers to be of approved materials and spaced in accordance with NFPA 13 and the piping manufacturer's specifications.
- B. The section modulus required by NFPA 13 shall be provided for all trapeze members supporting piping.

## 2.4 BACKFLOW PREVENTION

### A. Double Check Detector Backflow Preventer:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Ames.
  - b. Febco.
  - c. Watts.
  - d. Wilkins.
2. Pressure Rating: 175 psi minimum.
3. Accessories: Supervised OS&Y gate valves with flanged ends on inlet and outlet.

## 2.5 LISTED FIRE PROTECTION VALVES

### A. General Requirements:

1. Pressure Rating: 175 psi minimum.

### B. Indicating Butterfly Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Gruvlock.
  - b. Nibco.
  - c. Tyco.
  - d. Victaulic.
  - e. Viking.
2. Body Material: Cast Iron.
3. Supervisory Switch.

### C. Check Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Milwaukee Valve.
  - b. Mueller Co.
  - c. Nibco.
  - d. Stockham.
  - e. Tyco.
  - f. United Brass Works.
  - g. Victaulic.
2. Type: Swing check or wafer.
3. Body Material: Cast iron.

## D. OS&amp;Y Gate Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Milwaukee Valve.
  - b. Mueller Co.
  - c. Nibco.
  - d. Stockham.
  - e. Viking.
2. Body Material: Cast iron.
3. Supervisory Switch.

## E. Indicator Posts:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Crane Co.
  - b. Kennedy.
  - c. Mueller Co.
  - d. Nibco.
2. Type: Horizontal for wall mounting.
3. Body Material: Cast iron with extension rod and locking device.
4. Operation: Hand wheel.

## 2.6 TRIM AND DRAIN VALVES

## A. General Requirements:

1. Pressure Rating: 175 psi minimum.

## B. Angle Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Milwaukee Valve.
  - b. Nibco.
  - c. United Brass Works.

## C. Ball Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Milwaukee Valve.
  - b. Nibco.



- c. United Brass Works.
- d. Victaulic.

D. Globe Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Crane.
  - b. Milwaukee Valve.
  - c. Nibco.

## 2.7 SPECIALTY VALVES

A. General Requirements:

1. Pressure Rating 175 psi minimum.
2. Body Material: Cast iron.

B. Automatic (Ball Drip) Drain Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Nibco.
  - b. Reliable.
  - c. Tyco.
2. Type: Automatic draining, ball check.
3. Size: NPS 3/4.

## 2.8 FIRE DEPARTMENT CONNECTIONS

A. Exposed Standard Freestanding Type Fire Department Connection:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Croker.
  - b. Elkhart Brass.
  - c. Potter Roemer.
2. Pressure Rating: 175 psi minimum.
3. Body Material: Corrosion resistant metal.
4. Storz Inlet: Forged Aluminum with connection according to NFPA 1963 and matching local fire department sizes.
5. Caps: Aluminum, lugged type, with gasket and chain of same finish.
6. Storz Connection: 4 in. Storz inlet with NPS 4 outlet and 30 degree elbow.
7. Finish: Anodized Aluminum.
8. Escutcheon Plate Marking: Similar to "AUTO SPKR" of same finish.

## 2.9 SPRINKLER SPECIALTY PIPE FITTINGS

### A. General Requirements:

1. Pressure Rating: 175 psi minimum.

### B. Flow Detection and Alarm Test Drain Assemblies:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. AGF Manufacturing Inc. - Model 1011 with pressure relief.
2. Size: 2 in.
3. Inlet and Outlet: Threaded.

### C. Sprinkler Test Fittings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. AGF Manufacturing Inc.
  - b. Tyco.
  - c. Victaulic.
  - d. Viking.
2. Body Material: Cast or ductile iron housing with sight glass.
3. Size: Same as connected piping.
4. Inlet and Outlet: Threaded.

## 2.10 SPRINKLERS

### A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Globe.
2. Reliable.
3. Tyco.
4. Victaulic.
5. Viking.

### B. General Requirements:

1. Pressure Rating: 175 psi minimum.
2. Only sprinklers manufactured after January 1, 2017 will be accepted for use.
3. Only sprinklers manufactured utilizing Belleville spring seals will be acceptable for use.

### C. Sprinkler Types:

1. Chrome Recessed - Glass Bulb Quick Response Recessed Sprinkler with polished chrome recessed escutcheon 2-piece.
2. Brass Upright - Glass Bulb Quick Response Upright Sprinkler.

3. Brass Horizontal Sidewall - Glass Bulb Quick Response Horizontal Sidewall Sprinkler.
4. Early Suppression Fast Response (ESFR) Pendent Sprinkler.

D. Sprinkler Escutcheons: Materials, types, and finishes shall match sprinklers.

1. Escutcheons shall be listed for use with the sprinkler it is installed with.

E. Sprinkler Guards:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Globe.
  - b. Reliable.
  - c. Tyco.
  - d. Victaulic.
  - e. Viking.
2. Type: Wire cage with fastening device for attaching to sprinkler.

## 2.11 ALARM DEVICES

A. Alarm device types shall match piping and equipment connections.

B. Waterflow Switches - Vane Type:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Guardian.
  - b. Potter Electric.
  - c. System Sensor.
2. Waterflow Detector: Electrically supervised.
3. Components: Two single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 24-volt D.C. or 110-volt A.C.; complete with factory set, field-adjustable retard element to prevent false signals and tamperproof cover; corrosion resistant components in waterway; dust tight construction.
4. Type: Paddle operated.
5. Pressure Rating: 175 psi minimum.
6. Design Installation: Horizontal or vertical.
7. Signals waterflow that equals or exceeds 10 gpm.
8. 0 to 60 seconds adjustable range.
9. Detector shall be furnished and installed by the fire sprinkler contractor and wired complete by the fire alarm contractor.

C. Valve Supervisory Switches:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- a. Guardian.
  - b. Potter Electric.
  - c. System Sensor.
2. Type: Electrically supervised.
3. Components: Single-pole, double-throw switch with normally closed contacts; 24-volt D.C. or 110-volt A.C.; tamper proof cover; dust tight construction.
4. Design: Signals that controlled valve is in other than fully open position.
5. The supervisory switch shall be furnished and installed by the fire sprinkler contractor and wired complete by the fire alarm contractor.

## 2.12 PRESSURE GAGES

- 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. AMETEK; U.S. Gauge Division.
  2. Brecco Corporation.
  3. WIKA Instrument Corporation.
- B. Dial Size: 3½ to 4½-inch diameter.
- C. Pressure Gage Range: 0 to 250 psi minimum.
- D. Water System Piping Gage: Include "WATER" or "AIR/WATER" label on dial face.

## 2.13 SIGNS

- A. Approved enameled metal signs shall be securely attached at all main drains, auxiliary drains, alarm test connections and control valves.
- B. Provide a permanently attached placard indicating hydraulic design information in accordance with NFPA 13 and placed on the riser. A mock-up of placard shall be included with equipment literature.
- C. Provide a permanently attached placard indicating general information in accordance with NFPA 13 and placed on the riser. A mock-up of placard shall be included with equipment literature.

## 2.14 CORROSION MANAGEMENT

- A. Manual Air Vents
  1. Provide Manual Air Vents; 175 psi rated working pressure where indicated on drawings mounted in accordance with the manufacturer's instructions.

## PART 3 - EXECUTION

### 3.1 COORDINATION WITH OTHER TRADES

- A. Coordinate closely with all other trades to expedite construction and avoid interference.

### 3.2 SERVICE ENTRANCE PIPING

- A. Connect sprinkler piping to fire water service piping to building.

### 3.3 SYSTEM INSTALLATION

- A. Deviations from engineering documents require prior written approval from the Engineer of Record.
- B. Piping Standard: Comply with requirements in NFPA 13 for installation of sprinkler piping.
- C. Install Test Connections in sprinkler system piping as required.
- D. Auxiliary drains consisting of plugs, or globe valves and plugs where capacity of trapped pipe section exceeds 5 gallons, shall be provided to drain all points in the system that cannot be drained back to main riser.
- E. Install automatic (ball drip) drain valve at each check valve for fire department connection, or on piping between fire department connection and check valve. Install drain piping to exterior.
- F. Install alarm devices in piping systems.
- G. Install hangers and supports for sprinkler system piping according to NFPA 13.
- H. Install pressure gages where required by NFPA 13. Include pressure gages with connection not less than NPS ¼ and with soft metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they will not be subject to freezing.
- I. Sleeves shall be provided for piping passing through concrete slabs, concrete or masonry walls and partitions, through floors, ceilings, walls, or partitions of other building materials. Watertight sleeves caulked with mastic or lead shall be provided for floor slabs and walls on or below grade. Standard pipe or galvanized sheet metal sleeves shall be installed in above grade construction as may be required. The sleeves shall be of sufficient diameter to pass pipe lines with couplings or with insulation or annular area for caulking where required.
- J. Escutcheons shall be approved floor and ceiling plates made of steel or brass, plain or chromium plate finish and shall be installed around all exposed piping passing through a finished floor, wall or ceiling. The plates shall be of sufficient outside diameter to cover the sleeve opening and shall be provided with springs or set screws to insure them fitting snugly around the pipe.
- K. Sprinkler pipes shall not be routed over the door tracks in the service bays.

### 3.4 IDENTIFICATION

- A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13 and the local AHJs.

### 3.5 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:

1. Leak Test: After installation, hydrostatically test entire system and test for leaks by charging system to 200 psi in accordance with NFPA 13. Repair leaks and retest until no leaks exist.
  2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
  3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
  4. Coordinate with fire alarm tests. Operate as required.
  5. Verify that equipment hose threads are same as local fire department equipment.
- C. Tests shall be witnessed by the authority having jurisdiction, and Owner's authorized agent.
- D. Preliminary testing procedures shall be conducted as mentioned above to assure proper operation when the final testing is performed.
- E. The Contractor's Material and Test Certificates as shown in NFPA 13 must be completed and submitted to the Engineer before final acceptance may be given.

### 3.6 CLEANING

- A. Remove and replace sprinklers with paint, other than factory finish, including overspray.

### 3.7 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain fire sprinkler system components.
- B. After completion of all installation, tests, etc. and prior to the opening date, the sprinkler contractor shall instruct the Owner in the operation of the sprinkler system. Provide written operating instructions and mount on wall in a frame with glass front. Include the following so that the owner:
1. Will immediately recognize the main valves are in open or closed position.
  2. Will know how to drain the system.
  3. Will know how to reset the alarm system.
  4. Will know now to make complete weekly inspection.
  5. Will know how to maintain the system in accordance with NFPA 13 and 25.

END OF SECTION 211313

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 211313 – AUTOMATIC SPRINKLER SYSTEM

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the automatic sprinkler system is installed and is in general conformance with the Contract Documents, applicable Codes, and shop drawings. The automatic sprinkler system has been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

AUTOMATIC SPRINKLER SYSTEM INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (     ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (     ) \_\_\_\_\_





## SECTION 220513 - COMMON MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT

## 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 general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

## 1.3 COORDINATION

- A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:
  - 1. Motor controllers.
  - 2. Torque, speed, and horsepower requirements of the load.
  - 3. Ratings and characteristics of supply circuit and required control sequence.
  - 4. Ambient and environmental conditions of installation location.

## PART 2 - PRODUCTS

## 2.1 GENERAL MOTOR REQUIREMENTS

- A. Comply with NEMA MG 1 unless otherwise indicated.
- B. Comply with IEEE 841 for severe-duty motors.

## 2.2 MOTOR CHARACTERISTICS

- A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet (1000 m) above sea level.
- B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

## 2.3 SINGLE-PHASE MOTORS

- A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:

1. Permanent-split capacitor.
  2. Split phase.
  3. Capacitor start, inductor run.
  4. Capacitor start, capacitor run.
- B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.
- C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.
- D. Motors 1/20 HP and Smaller: Shaded-pole type.
- E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 220513

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 220513 – COMMON MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the common motor requirements for plumbing equipment are installed and are in general conformance with the Contract Documents, applicable Codes, and shop drawings. The common motor requirements for plumbing equipment have been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

COMMON MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT INSTALLER:

(Subcontractor Signature)

\_\_\_\_\_  
(Subcontractor name and address) Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address) Phone Number: (    ) \_\_\_\_\_



## SECTION 220517 - SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Sleeves.
  - 2. Sleeve-seal systems.
  - 3. Sleeve-seal fittings.
  - 4. Grout.

## 1.3 ACTION SUBMITTALS

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

## PART 2 - PRODUCTS

## 2.1 SLEEVES

- A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.
- B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.
- C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.
- D. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.
- E. Galvanized-Steel-Sheet Sleeves: 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint.
- F. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.
- G. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.

## 2.2 SLEEVE-SEAL SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. Advance Products & Systems, Inc.
  - 2. CALPICO, Inc.
  - 3. Metraflex Company (The).
  - 4. Pipeline Seal and Insulator, Inc.
  - 5. Proco Products, Inc.
- B. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
  - 1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
  - 2. Pressure Plates: Plastic.
  - 3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

## 2.3 SLEEVE-SEAL FITTINGS

- A. Manufacturers: 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. HOLDRITE.
- B. Description: Manufactured plastic, sleeve-type, waterstop assembly made for imbedding in concrete slab or wall. Unit has plastic or rubber waterstop collar with center opening to match piping OD.

## 2.4 GROUT

- A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Nonshrink; recommended for interior and exterior applications.
- C. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

# PART 3 - EXECUTION

## 3.1 SLEEVE INSTALLATION

- A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.
- B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch (25-mm) annular clear space between piping and concrete slabs and walls.
  - 1. Sleeves are not required for core-drilled holes.
- C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
  2. Cut sleeves to length for mounting flush with both surfaces.
    - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches (50 mm) above finished floor level.
  3. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.
- D. Install sleeves for pipes passing through interior partitions.
1. Cut sleeves to length for mounting flush with both surfaces.
  2. Install sleeves that are large enough to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pipe or pipe insulation.
  3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 079200 "Joint Sealants."
- E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

### 3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.
- B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

### 3.3 SLEEVE-SEAL-FITTING INSTALLATION

- A. Install sleeve-seal fittings in new walls and slabs as they are constructed.
- B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.
- C. Secure nailing flanges to concrete forms.
- D. Using grout, seal the space around outside of sleeve-seal fittings.

### 3.4 SLEEVE AND SLEEVE-SEAL SCHEDULE

- A. Use sleeves and sleeve seals for the following piping-penetration applications:
  1. Exterior Concrete Walls above Grade:
    - a. Piping Smaller Than NPS 6 (DN 150): Sleeve-seal fittings.
    - b. Piping NPS 6 (DN 150) and Larger: Cast-iron wall sleeves.
  2. Exterior Concrete Walls below Grade:
    - a. Piping Smaller Than NPS 6 (DN 150): Sleeve-seal fittings.
      - 1) Select sleeve size to allow for 1-inch (25-mm) annular clear space between piping and sleeve for installing sleeve-seal system.

- b. Piping NPS 6 (DN 150) and Larger: Cast-iron wall sleeves with sleeve-seal system.
    - 1) Select sleeve size to allow for 1-inch (25-mm) annular clear space between piping and sleeve for installing sleeve-seal system.
- 3. Concrete Slabs-on-Grade:
  - a. Piping Smaller Than NPS 6 (DN 150): Sleeve-seal fittings.
    - 1) Select sleeve size to allow for 1-inch (25-mm) annular clear space between piping and sleeve for installing sleeve-seal system.
  - b. Piping NPS 6 (DN 150) and Larger: Cast-iron wall sleeves with sleeve-seal system.
    - 1) Select sleeve size to allow for 1-inch (25-mm) annular clear space between piping and sleeve for installing sleeve-seal system.
- 4. Interior Partitions:
  - a. Piping Smaller Than NPS 6 (DN 150): PVC-pipe sleeves.
  - b. Piping NPS 6 (DN 150) and Larger: Galvanized-steel-sheet sleeves.

END OF SECTION 220517



CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 220517 – SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the sleeves and sleeve seals for plumbing piping are installed and are in general conformance with the Contract Documents, applicable Codes, and shop drawings. The sleeves and sleeve seals for plumbing piping have been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

SLEEVE AND SLEEVE SEAL FOR PLUMBING PIPING INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_



## SECTION 220518 - ESCUTCHEONS FOR PLUMBING PIPING

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Escutcheons.
  - 2. Floor plates.

## 1.3 ACTION SUBMITTALS

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

## PART 2 - PRODUCTS

## 2.1 ESCUTCHEONS

- A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.
- C. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.
- D. Split-Casting Brass Type: With polished, chrome-plated finish and with concealed hinge and setscrew.
- E. Split-Plate, Stamped-Steel Type: With chrome-plated finish, concealed hinge, and spring-clip fasteners.

## 2.2 FLOOR PLATES

- A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.
- B. Split-Casting Floor Plates: Cast brass with concealed hinge.

## PART 3 - EXECUTION

## 3.1 INSTALLATION

- A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.
- B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of insulated piping and with OD that completely covers opening.
  - 1. Escutcheons for New Piping:
    - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
    - b. Chrome-Plated Piping: One-piece, cast-brass type with polished, chrome-plated finish.
    - c. Insulated Piping: One-piece, stamped-steel type.
    - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
    - e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
    - f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
    - g. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type.
    - h. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
    - i. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type.
    - j. Bare Piping in Equipment Rooms: One-piece, cast-brass type with polished, chrome-plated finish.
    - k. Bare Piping in Equipment Rooms: One-piece, stamped-steel type.
- C. Install floor plates for piping penetrations of equipment-room floors.
- D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.
  - 1. New Piping: One-piece, floor-plate type.
  - 2. Existing Piping: Split-casting, floor-plate type.

## 3.2 FIELD QUALITY CONTROL

- A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION 220518

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 220518 – ESCUTCHEONS FOR PLUMBING PIPING

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the escutcheons for plumbing piping are installed and are in general conformance with the Contract Documents, applicable Codes, and shop drawings. The escutcheons for plumbing piping have been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

ESCUTCHEONS FOR PLUMBING PIPING INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_



## SECTION 220519 - METERS AND GAGES FOR PLUMBING PIPING

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Bimetallic-actuated thermometers.
  - 2. Filled-system thermometers.
  - 3. Liquid-in-glass thermometers.
  - 4. Thermowells.
  - 5. Dial-type pressure gages.
  - 6. Gage attachments.
  - 7. Test plugs.
  - 8. Test-plug kits.
- B. Related Sections:
  - 1. Section 221113 "Facility Water Distribution Piping" for domestic water meters and combined domestic and fire-protection water-service meters outside the building.
  - 2. Section 221116 "Domestic Water Piping" for water meters inside the building.

## 1.3 ACTION SUBMITTALS

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

## 1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of meter and gage, from manufacturer.

## 1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For meters and gages to include in operation and maintenance manuals.

## PART 2 - PRODUCTS

## 2.1 BIMETALLIC-ACTUATED THERMOMETERS

- 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. Palmer Wahl Instrumentation Group.

2. Watts; a Watts Water Technologies company.
  3. Weiss Instruments, Inc.
  4. Winters Instruments - U.S.
- B. Standard: ASME B40.200.
- C. Case: Liquid-filled and sealed type(s); stainless steel with 3-inch (76-mm) nominal diameter.
- D. Dial: Nonreflective aluminum with permanently etched scale markings and scales in deg F (deg C).
- E. Connector Type(s): Union joint, adjustable angle, with unified-inch screw threads.
- F. Connector Size: 1/2 inch (13 mm), with ASME B1.1 screw threads.
- G. Stem: 0.25 or 0.375 inch (6.4 or 9.4 mm) in diameter; stainless steel.
- H. Window: Plain glass.
- I. Ring: Stainless steel.
- J. Element: Bimetal coil.
- K. Pointer: Dark-colored metal.
- L. Accuracy: Plus or minus 1 percent of scale range.

## 2.2 LIQUID-IN-GLASS THERMOMETERS

- A. Metal-Case, Compact-Style, Liquid-in-Glass Thermometers:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Terice, H. O. Co.
  2. Standard: ASME B40.200.
  3. Case: Cast aluminum; 6-inch (152-mm) nominal size.
  4. Case Form: Back angle unless otherwise indicated.
  5. Tube: Glass with magnifying lens and blue or red organic liquid.
  6. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F (deg C).
  7. Window: Glass or plastic.
  8. Stem: Aluminum or brass and of length to suit installation.
    - a. Design for Thermowell Installation: Bare stem.
  9. Connector: 3/4 inch (19 mm), with ASME B1.1 screw threads.
  10. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.
- B. Plastic-Case, Compact-Style, Liquid-in-Glass Thermometers:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Tel-Tru Manufacturing Company.
    - b. Watts; a Watts Water Technologies company.
    - c. Weiss Instruments, Inc.



- d. WIKA Instrument Corporation.
2. Standard: ASME B40.200.
3. Case: Plastic; 6-inch (152-mm) nominal size.
4. Case Form: Back angle unless otherwise indicated.
5. Tube: Glass with magnifying lens and blue or red organic liquid.
6. Tube Background: Nonreflective with permanently etched scale markings graduated in deg F (deg C).
7. Window: Glass or plastic.
8. Stem: Aluminum or brass and of length to suit installation.
  - a. Design for Thermowell Installation: Bare stem.
9. Connector: 3/4 inch (19 mm), with ASME B1.1 screw threads.
10. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

## 2.3 THERMOWELLS

- A. Thermowells:
  1. Standard: ASME B40.200.
  2. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.
  3. Material for Use with Copper Tubing: CNR or CUNI.
  4. Material for Use with Steel Piping: CRES.
  5. Type: Stepped shank unless straight or tapered shank is indicated.
  6. External Threads: NPS 1/2, NPS 3/4, or NPS 1, (DN 15, DN 20, or NPS 25,) ASME B1.20.1 pipe threads.
  7. Internal Threads: 1/2, 3/4, and 1 inch (13, 19, and 25 mm), with ASME B1.1 screw threads.
  8. Bore: Diameter required to match thermometer bulb or stem.
  9. Insertion Length: Length required to match thermometer bulb or stem.
  10. Lagging Extension: Include on thermowells for insulated piping and tubing.
  11. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.
- B. Heat-Transfer Medium: Mixture of graphite and glycerin.

## 2.4 PRESSURE GAGES

- A. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:
  1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Palmer Wahl Instrumentation Group.
    - b. Watts; a Watts Water Technologies company.
    - c. Weiss Instruments, Inc.
    - d. Winters Instruments - U.S.
  2. Standard: ASME B40.100.
  3. Case: Liquid-filled Sealed type(s); cast aluminum or drawn steel; 4-1/2-inch (114-mm) nominal diameter.
  4. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
  5. Pressure Connection: Brass, with NPS 1/4 or NPS 1/2 (DN 8 or DN 15), ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
  6. Movement: Mechanical, with link to pressure element and connection to pointer.
  7. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi (kPa).
  8. Pointer: Dark-colored metal.

9. Window: Glass or plastic.
  10. Ring: Metal.
  11. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.
- B. Direct-Mounted, Plastic-Case, Dial-Type Pressure Gages:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Ashcroft Inc.
    - b. Palmer Wahl Instrumentation Group.
    - c. Tel-Tru Manufacturing Company.
    - d. Weiss Instruments, Inc.
    - e. Weksler Glass Thermometer Corp.
  2. Standard: ASME B40.100.
  3. Case: Sealed type; plastic; 4-1/2-inch (114-mm) nominal diameter.
  4. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
  5. Pressure Connection: Brass, with NPS 1/4 or NPS 1/2 (DN 8 or DN 15), ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
  6. Movement: Mechanical, with link to pressure element and connection to pointer.
  7. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi (kPa).
  8. Pointer: Dark-colored metal.
  9. Window: Glass or plastic.
  10. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.
- C. Remote-Mounted, Metal-Case, Dial-Type Pressure Gages:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Ashcroft Inc.
    - b. Palmer Wahl Instrumentation Group.
    - c. Watts; a Watts Water Technologies company.
    - d. Weiss Instruments, Inc.
  2. Standard: ASME B40.100.
  3. Case: Liquid-filled Sealed type; metal; 4-1/2-inch (114-mm) nominal diameter with back flange and holes for panel mounting.
  4. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
  5. Pressure Connection: Brass, with NPS 1/4 or NPS 1/2 (DN 8 or DN 15), ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
  6. Movement: Mechanical, with link to pressure element and connection to pointer.
  7. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi (kPa).
  8. Pointer: Dark-colored metal.
  9. Window: Glass or plastic.
  10. Ring: Metal.
  11. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.
- D. Remote-Mounted, Plastic-Case, Dial-Type Pressure Gages:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Ashcroft Inc.
    - b. Palmer Wahl Instrumentation Group.
    - c. Weiss Instruments, Inc.
    - d. Winters Instruments - U.S.
  2. Standard: ASME B40.100.

3. Case: Sealed type; plastic; 4-1/2-inch (114-mm) nominal diameter with back flange and holes for panel mounting.
4. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
5. Pressure Connection: Brass, with NPS 1/4 or NPS 1/2 (DN 8 or DN 15), ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
6. Movement: Mechanical, with link to pressure element and connection to pointer.
7. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi (kPa).
8. Pointer: Dark-colored metal.
9. Window: Glass or plastic.
10. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

## 2.5 GAGE ATTACHMENTS

- A. Snubbers: ASME B40.100, brass; with NPS 1/4 or NPS 1/2 (DN 8 or DN 15), ASME B1.20.1 pipe threads and piston-type surge-dampening device. Include extension for use on insulated piping.
- B. Valves: Brass ball, with NPS 1/4 or NPS 1/2 (DN 8 or DN 15), ASME B1.20.1 pipe threads.

## 2.6 TEST PLUGS

- 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. Peterson Equipment Co., Inc.
  2. Sisco Manufacturing Company, Inc.
  3. Watts; a Watts Water Technologies company.
  4. Weiss Instruments, Inc.
  5. Weksler Glass Thermometer Corp.
- B. Description: Test-station fitting made for insertion into piping tee fitting.
- C. Body: Brass or stainless steel with core inserts and gasketed and threaded cap. Include extended stem on units to be installed in insulated piping.
- D. Thread Size: NPS 1/4 (DN 8) or NPS 1/2 (DN 15), ASME B1.20.1 pipe thread.
- E. Minimum Pressure and Temperature Rating: 500 psig at 200 deg F (3450 kPa at 93 deg C).
- F. Core Inserts: Chlorosulfonated polyethylene synthetic and EPDM self-sealing rubber.

## 2.7 TEST-PLUG KITS

- 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. Sisco Manufacturing Company, Inc.
  2. Watts; a Watts Water Technologies company.
  3. Weiss Instruments, Inc.
- B. Furnish one test-plug kit(s) containing one thermometer(s), one pressure gage and adapter, and carrying case. Thermometer sensing elements, pressure gage, and adapter probes shall be of diameter to fit test plugs and of length to project into piping.

- C. Low-Range Thermometer: Small, bimetallic insertion type with 1- to 2-inch- (25- to 51-mm-) diameter dial and tapered-end sensing element. Dial range shall be at least 25 to 125 deg F (minus 4 to plus 52 deg C).
- D. High-Range Thermometer: Small, bimetallic insertion type with 1- to 2-inch- (25- to 51-mm-) diameter dial and tapered-end sensing element. Dial range shall be at least 0 to 220 deg F (minus 18 to plus 104 deg C).
- E. Pressure Gage: Small, Bourdon-tube insertion type with 2- to 3-inch- (51- to 76-mm-) diameter dial and probe. Dial range shall be at least 0 to 200 psig (0 to 1380 kPa).
- F. Carrying Case: Metal or plastic, with formed instrument padding.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Install thermowells with socket extending one-third of pipe diameter and in vertical position in piping tees.
- B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.
- C. Install thermowells with extension on insulated piping.
- D. Fill thermowells with heat-transfer medium.
- E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.
- F. Install remote-mounted thermometer bulbs in thermowells and install cases on panels; connect cases with tubing and support tubing to prevent kinks. Use minimum tubing length.
- G. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.
- H. Install remote-mounted pressure gages on panel.
- I. Install test plugs in piping tees.
- J. Install thermometers in the following locations:
  - 1. Inlet and outlet of each water heater.
  - 2. Inlet and outlet of each domestic hot-water storage tank.
- K. Install pressure gages in the following locations:
  - 1. Building water service entrance into building.
  - 2. Inlet and outlet of each pressure-reducing valve.
  - 3. Suction and discharge of each domestic water pump.

#### 3.2 CONNECTIONS

- A. Install meters and gages adjacent to machines and equipment to allow service and maintenance of meters, gages, machines, and equipment.

### 3.3 ADJUSTING

- A. Adjust faces of meters and gages to proper angle for best visibility.

### 3.4 THERMOMETER SCHEDULE

- A. Thermometers at inlet and outlet of each domestic water heater shall be one of the following:
  - 1. Liquid-filled Sealed, bimetallic-actuated type.
  - 2. Direct-mounted, metal-case, vapor-actuated type.
  - 3. Compact-style, liquid-in-glass type.
  - 4. Test plug with chlorosulfonated polyethylene synthetic self-sealing rubber inserts.
- B. Thermometers at inlet and outlet of each domestic hot-water storage tank shall be one of the following:
  - 1. Liquid-filled Sealed, bimetallic-actuated type.
  - 2. Direct-mounted, metal-case, vapor-actuated type.
  - 3. Compact-style, liquid-in-glass type.
  - 4. Test plug with chlorosulfonated polyethylene synthetic self-sealing rubber inserts.
- C. Thermometer stems shall be of length to match thermowell insertion length.

### 3.5 THERMOMETER SCALE-RANGE SCHEDULE

- A. Scale Range for Domestic Cold-Water Piping: 0 to 100 deg F (Minus 20 to plus 50 deg C).
- B. Scale Range for Domestic Hot-Water Piping: 20 to 240 deg F (0 to 150 deg C).

### 3.6 PRESSURE-GAGE SCHEDULE

- A. Pressure gages at discharge of each water service into building shall be one of the following:
  - 1. Liquid-filled Sealed, direct-mounted, metal case.
  - 2. Sealed, direct-mounted, plastic case.
  - 3. Test plug with chlorosulfonated polyethylene synthetic self-sealing rubber inserts.
- B. Pressure gages at inlet and outlet of each water pressure-reducing valve shall be one of the following:
  - 1. Liquid-filled Sealed, direct-mounted, metal case.
  - 2. Sealed, direct-mounted, plastic case.
  - 3. Test plug with chlorosulfonated polyethylene synthetic self-sealing rubber inserts.

### 3.7 PRESSURE-GAGE SCALE-RANGE SCHEDULE

- A. Scale Range for Water Service Piping: 0 to 160 psi (0 to 1100 kPa).
- B. Scale Range for Domestic Water Piping: 0 to 160 psi (0 to 1100 kPa).

END OF SECTION 220519

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 220519 – METERS AND GAGES FOR PLUMBING PIPING

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the meters and gages for plumbing piping are installed and are in general conformance with the Contract Documents, applicable Codes, and shop drawings. The meters and gages for plumbing piping have been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

METERS AND GAGES FOR PLUMBING PIPING INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_

## SECTION 220523.12 - BALL VALVES FOR PLUMBING PIPING

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Brass ball valves.
  - 2. Bronze ball valves.
  - 3. Steel ball valves.
  - 4. Iron ball valves.

## 1.3 DEFINITIONS

- A. CWP: Cold working pressure.

## 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of valve.
  - 1. Certification that products comply with NSF 61 Annex G and NSF 372.

## 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
  - 1. Protect internal parts against rust and corrosion.
  - 2. Protect threads, flange faces, and soldered ends.
  - 3. Set ball valves open to minimize exposure of functional surfaces.
- B. Use the following precautions during storage:
  - 1. Maintain valve end protection.
  - 2. Store valves indoors and maintain at higher-than-ambient-dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.
- C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use operating handles or stems as lifting or rigging points.

## PART 2 - PRODUCTS

## 2.1 GENERAL REQUIREMENTS FOR VALVES

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.
- B. ASME Compliance:
  - 1. ASME B1.20.1 for threads for threaded end valves.
  - 2. ASME B16.1 for flanges on iron valves.
  - 3. ASME B16.5 for flanges on steel valves.
  - 4. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
  - 5. ASME B16.18 for solder-joint connections.
  - 6. ASME B31.9 for building services piping valves.
- C. NSF Compliance: NSF 61 Annex G and NSF 372 for valve materials for potable-water service.
- D. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.
- E. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- F. Valve Sizes: Same as upstream piping unless otherwise indicated.
- G. Valve Actuator Types:
  - 1. Gear Actuator: For quarter-turn valves NPS 4 (DN 100) and larger.
  - 2. Hand lever: For quarter-turn valves smaller than NPS 4 (DN 100).
- H. Valves in Insulated Piping:
  - 1. Include 2-inch (50-mm) stem extensions.
  - 2. Extended operating handles of nonthermal-conductive material and protective sleeves that allow operation of valves without breaking vapor seals or disturbing insulation.
  - 3. Memory stops that are fully adjustable after insulation is applied.

## 2.2 BRASS BALL VALVES

- A. One-Piece, Brass Ball Valves:
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. KITZ Corporation.
  - 2. Description:
    - a. Standard: MSS SP-110.
    - b. CWP Rating: 400 psig (2760 kPa).
    - c. Body Design: One piece.
    - d. Body Material: Forged brass or bronze.
    - e. Ends: Threaded and soldered.
    - f. Seats: PTFE.
    - g. Stem: Brass or stainless steel.
    - h. Ball: Chrome-plated brass or stainless steel.



- i. Port: Reduced.
- B. Two-Piece, Brass Ball Valves with Full Port and Brass Trim:
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. American Valve, Inc.
    - b. Conbraco Industries, Inc.
    - c. Crane; Crane Energy Flow Solutions.
    - d. Hammond Valve.
    - e. Jomar Valve.
    - f. Legend Valve & Fitting, Inc.
    - g. Marwin Valve; Richards Industries.
    - h. Milwaukee Valve Company.
    - i. NIBCO INC.
    - j. Red-White Valve Corporation.
    - k. Stockham; Crane Energy Flow Solutions.
    - l. Watts; a Watts Water Technologies company.
  - 2. Description:
    - a. Standard: MSS SP-110.
    - b. CWP Rating: 600 psig (4140 kPa).
    - c. Body Design: Two piece.
    - d. Body Material: Forged brass.
    - e. Ends: Threaded and soldered.
    - f. Seats: PTFE.
    - g. Stem: Brass.
    - h. Ball: Chrome-plated brass.
    - i. Port: Full.
- C. Two-Piece, Brass Ball Valves with Full Port and Stainless-Steel Trim:
- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Jomar Valve.
    - b. KITZ Corporation.
    - c. Marwin Valve; Richards Industries.
    - d. Milwaukee Valve Company.
  - 2. Description:
    - a. Standard: MSS SP-110.
    - b. CWP Rating: 600 psig (4140 kPa).
    - c. Body Design: Two piece.
    - d. Body Material: Forged brass.
    - e. Ends: Threaded and soldered.
    - f. Seats: PTFE.
    - g. Stem: Stainless steel.
    - h. Ball: Stainless steel, vented.
    - i. Port: Full.
- D. Two-Piece, Brass Ball Valves with Regular Port and Brass Trim:
- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Hammond Valve.
    - b. Legend Valve & Fitting, Inc.
    - c. Milwaukee Valve Company.
    - d. NIBCO INC.
    - e. Watts; a Watts Water Technologies company.

2. Description:
    - a. Standard: MSS SP-110.
    - b. CWP Rating: 600 psig (4140 kPa).
    - c. Body Design: Two piece.
    - d. Body Material: Forged brass.
    - e. Ends: Threaded and soldered.
    - f. Seats: PTFE.
    - g. Stem: Brass.
    - h. Ball: Chrome-plated brass.
    - i. Port: Regular.
- E. Two-Piece, Brass Ball Valves with Regular Port and Stainless-Steel Trim:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Jamesbury; Metso.
  2. Description:
    - a. Standard: MSS SP-110.
    - b. CWP Rating: 600 psig (4140 kPa).
    - c. Body Design: Two piece.
    - d. Body Material: Brass or bronze.
    - e. Ends: Threaded and soldered.
    - f. Seats: PTFE.
    - g. Stem: Stainless steel.
    - h. Ball: Stainless steel, vented.
    - i. Port: Regular.
- F. Three-Piece, Brass Ball Valves with Full Port and Brass Trim:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Jomar Valve.
    - b. KITZ Corporation.
    - c. Watts; a Watts Water Technologies company.
  2. Description:
    - a. Standard: MSS SP-110.
    - b. CWP Rating: 600 psig (4140 kPa).
    - c. Body Design: Three piece.
    - d. Body Material: Forged brass.
    - e. Ends: Threaded and soldered.
    - f. Seats: PTFE.
    - g. Stem: Brass.
    - h. Ball: Chrome-plated brass.
    - i. Port: Full.
- G. Three-Piece, Brass Ball Valves with Full Port and Stainless-Steel Trim:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Marwin Valve; Richards Industries.
  2. Description:
    - a. Standard: MSS SP-110.
    - b. CWP Rating: 600 psig (4140 kPa).
    - c. Body Design: Three piece.
    - d. Body Material: Forged brass.
    - e. Ends: Threaded and soldered.

- f. Seats: PTFE.
- g. Stem: Stainless steel.
- h. Ball: Stainless steel, vented.
- i. Port: Full.

## 2.3 BRONZE BALL VALVES

### A. One-Piece, Bronze Ball Valves with Bronze Trim:

- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. Conbraco Industries, Inc.
  - b. NIBCO INC.
  - c. Watts; a Watts Water Technologies company.
- 2. Description:
  - a. Standard: MSS SP-110.
  - b. CWP Rating: 400 psig (2760 kPa).
  - c. Body Design: One piece.
  - d. Body Material: Bronze.
  - e. Ends: Threaded.
  - f. Seats: PTFE.
  - g. Stem: Bronze.
  - h. Ball: Chrome-plated brass.
  - i. Port: Reduced.

### B. One-Piece, Bronze Ball Valves with Stainless-Steel Trim:

- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. Conbraco Industries, Inc.
  - b. NIBCO INC.
  - c. Watts; a Watts Water Technologies company.
- 2. Description:
  - a. Standard: MSS SP-110.
  - b. CWP Rating: 600 psig (4140 kPa).
  - c. Body Design: One piece.
  - d. Body Material: Bronze.
  - e. Ends: Threaded.
  - f. Seats: PTFE.
  - g. Stem: Stainless steel.
  - h. Ball: Stainless steel, vented.
  - i. Port: Reduced.

### C. Two-Piece, Bronze Ball Valves with Full Port, and Bronze or Brass Trim:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Conbraco Industries, Inc.
  - b. Crane; Crane Energy Flow Solutions.
  - c. Hammond Valve.
  - d. Lance Valves.
  - e. Milwaukee Valve Company.
  - f. NIBCO INC.
  - g. Watts; a Watts Water Technologies company.
  - h. Zurn Industries, LLC.
- 2. Description:

- a. Standard: MSS SP-110.
  - b. CWP Rating: 600 psig (4140 kPa).
  - c. Body Design: Two piece.
  - d. Body Material: Bronze.
  - e. Ends: Threaded and soldered.
  - f. Seats: PTFE.
  - g. Stem: Bronze or brass.
  - h. Ball: Chrome-plated brass.
  - i. Port: Full.
- D. Two-Piece, Bronze Ball Valves with Full Port and Stainless-Steel Trim:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Conbraco Industries, Inc.
    - b. Crane; Crane Energy Flow Solutions.
    - c. Hammond Valve.
    - d. Lance Valves.
    - e. Milwaukee Valve Company.
    - f. NIBCO INC.
    - g. Watts; a Watts Water Technologies company.
  - 2. Description:
    - a. Standard: MSS SP-110.
    - b. CWP Rating: 600 psig (4140 kPa).
    - c. Body Design: Two piece.
    - d. Body Material: Bronze.
    - e. Ends: Threaded or soldered.
    - f. Seats: PTFE.
    - g. Stem: Stainless steel.
    - h. Ball: Stainless steel, vented.
    - i. Port: Full.
- E. Two-Piece, Bronze Ball Valves with Regular Port and Bronze or Brass Trim:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Conbraco Industries, Inc.
    - b. DynaQuip Controls.
    - c. Hammond Valve.
    - d. Milwaukee Valve Company.
    - e. NIBCO INC.
    - f. Watts; a Watts Water Technologies company.
  - 2. Description:
    - a. Standard: MSS SP-110.
    - b. CWP Rating: 600 psig (4140 kPa).
    - c. Body Design: Two piece.
    - d. Body Material: Bronze.
    - e. Ends: Threaded.
    - f. Seats: PTFE.
    - g. Stem: Bronze or brass.
    - h. Ball: Chrome-plated brass.
    - i. Port: Regular.
- F. Two-Piece, Bronze Ball Valves with Regular Port and Stainless-Steel Trim:
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Conbraco Industries, Inc.

- b. Hammond Valve.
    - c. NIBCO INC.
    - d. Stockham; Crane Energy Flow Solutions.
    - e. Watts; a Watts Water Technologies company.
  - 2. Description:
    - a. Standard: MSS SP-110.
    - b. CWP Rating: 600 psig (4140 kPa).
    - c. Body Design: Two piece.
    - d. Body Material: Bronze.
    - e. Ends: Threaded.
    - f. Seats: PTFE.
    - g. Stem: Stainless steel.
    - h. Ball: Stainless steel, vented.
    - i. Port: Regular.
- G. Three-Piece, Bronze Ball Valves with Full Port and Bronze or Brass Trim:
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Conbraco Industries, Inc.
    - b. DynaQuip Controls.
    - c. Hammond Valve.
    - d. Milwaukee Valve Company.
    - e. NIBCO INC.
    - f. Red-White Valve Corporation.
    - g. Watts; a Watts Water Technologies company.
  - 2. Description:
    - a. Standard: MSS SP-110.
    - b. CWP Rating: 600 psig (4140 kPa).
    - c. Body Design: Three piece.
    - d. Body Material: Bronze.
    - e. Ends: Threaded.
    - f. Seats: PTFE.
    - g. Stem: Bronze or brass.
    - h. Ball: Chrome-plated brass.
    - i. Port: Full.
- H. Three-Piece, Bronze Ball Valves with Full Port and Stainless-Steel Trim:
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Conbraco Industries, Inc.
    - b. Hammond Valve.
    - c. Milwaukee Valve Company.
    - d. NIBCO INC.
    - e. Watts; a Watts Water Technologies company.
  - 2. Description:
    - a. Standard: MSS SP-110.
    - b. CWP Rating: 600 psig (4140 kPa).
    - c. Body Design: Three piece.
    - d. Body Material: Bronze.
    - e. Ends: Threaded.
    - f. Seats: PTFE.
    - g. Stem: Stainless steel.
    - h. Ball: Stainless steel, vented.
    - i. Port: Full.

- I. Three-Piece, Bronze Ball Valves with Regular Port and Bronze Trim:
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Conbraco Industries, Inc.
    - b. Jamesbury; Metso.
    - c. NIBCO INC.
  - 2. Description:
    - a. Standard: MSS SP-110.
    - b. CWP Rating: 600 psig (4140 kPa).
    - c. Body Design: Three piece
    - d. Body Material: Bronze
    - e. Ends: Threaded or soldered.
    - f. Seats: PTFE.
    - g. Stem: Bronze.
    - h. Ball: Chrome-plated brass.
    - i. Port: Regular.
- J. Three-Piece, Bronze Ball Valves with Regular Port and Stainless-Steel Trim:
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Conbraco Industries, Inc.
    - b. Jamesbury; Metso.
    - c. NIBCO INC.
  - 2. Description:
    - a. Standard: MSS SP-110.
    - b. CWP Rating: 600 psig (4140 kPa).
    - c. Body Design: Three piece.
    - d. Body Material: Bronze.
    - e. Ends: Threaded or soldered.
    - f. Seats: PTFE.
    - g. Stem: Stainless steel.
    - h. Ball: Stainless steel, vented.
    - i. Port: Regular.
- K. Two-Piece, Safety-Exhaust, Bronze Ball Valves:
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Conbraco Industries, Inc.
    - b. Jamesbury; Metso.
    - c. NIBCO INC.
  - 2. Description:
    - a. Standard: MSS SP-110.
    - b. CWP Rating: 600 psig (4140 kPa).
    - c. Body Design: Two piece.
    - d. Body Material: Bronze, ASTM B 584, Alloy C844.
    - e. Ends: Threaded.
    - f. Seats: PTFE.
    - g. Stem: Stainless steel.
    - h. Ball: Chrome-plated brass, with exhaust vent opening for pneumatic applications.
    - i. Port: Full.

## 2.4 STEEL BALL VALVES

- A. Class 150, Steel Ball Valves with Full Port:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Conbraco Industries, Inc.
    - b. Jamesbury; Metso.
    - c. NIBCO INC.
  2. Description:
    - a. Standard: MSS SP-72.
    - b. CWP Rating: 285 psig (1964 kPa).
    - c. Body Design: Split body.
    - d. Body Material: Carbon steel, ASTM A 216, Type WCB.
    - e. Ends: Flanged or threaded.
    - f. Seats: PTFE.
    - g. Stem: Stainless steel.
    - h. Ball: Stainless steel, vented.
    - i. Port: Full.
- B. Class 150, Steel Ball Valves with Regular Port:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Conbraco Industries, Inc.
    - b. Jamesbury; Metso.
    - c. NIBCO INC.
  2. Description:
    - a. Standard: MSS SP-72.
    - b. CWP Rating: 285 psig (1964 kPa).
    - c. Body Design: Uni-body.
    - d. Body Material: Carbon steel, ASTM A 216, Type WCB.
    - e. Ends: Flanged or threaded.
    - f. Seats: PTFE.
    - g. Stem: Stainless steel.
    - h. Ball: Stainless steel, vented.
    - i. Port: Regular.

## 2.5 IRON BALL VALVES

- A. Class 125, Iron Ball Valves:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. American Valve, Inc.
    - b. Conbraco Industries, Inc.
    - c. KITZ Corporation.
    - d. Sure Flow Equipment Inc.
    - e. Watts; a Watts Water Technologies company.
    - f. Zurn Industries, LLC.
  2. Description:
    - a. Standard: MSS SP-72.
    - b. CWP Rating: 200 psig (1380 kPa).
    - c. Body Design: Split body.
    - d. Body Material: ASTM A 126, gray iron.

- e. Ends: Flanged or threaded.
- f. Seats: PTFE.
- g. Stem: Stainless steel.
- h. Ball: Stainless steel.
- i. Port: Full.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine threads on valve and mating pipe for form and cleanliness.
- D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- E. Do not attempt to repair defective valves; replace with new valves.

#### 3.2 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.
- E. Install valve tags. Comply with requirements in Section 220553 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

#### 3.3 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.
- B. Select valves with the following end connections:
  - 1. For Copper Tubing, NPS 2 (DN 50) and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
  - 2. For Copper Tubing, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Flanged ends except where threaded valve-end option is indicated in valve schedules below.
  - 3. For Copper Tubing, NPS 5 (DN 125) and Larger: Flanged ends.
  - 4. For Steel Piping, NPS 2 (DN 50) and Smaller: Threaded ends.



5. For Steel Piping, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Flanged ends except where threaded valve-end option is indicated in valve schedules below.
6. For Steel Piping, NPS 5 (DN 125) and Larger: Flanged ends.

### 3.4 LOW-PRESSURE, COMPRESSED-AIR VALVE SCHEDULE (150 PSIG (1035 kPa) OR LESS)

- A. Pipe NPS 2 (DN 50) and Smaller:
  1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.
  2. One piece, brass ball valve.
  3. One piece, bronze ball valve with bronze trim.
  4. Two-piece, brass ball valves with full port and brass trim.
  5. Two-piece, bronze ball valves with full port and bronze or brass trim.
  6. Three-piece, brass ball valves with full port and brass trim.
  7. Three-piece, bronze ball valves with full port and bronze or brass trim.
  8. Two-piece, bronze ball valves with regular port and bronze trim.
- B. Pipe NPS 2-1/2 (DN 65) and Larger:
  1. Steel and Iron Valves, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): May be provided with threaded ends instead of flanged ends.
  2. Class 150, steel ball valves with full port.
  3. Class 150, iron ball valves.

### 3.5 HIGH-PRESSURE, COMPRESSED-AIR VALVE SCHEDULE (150 TO 200 PSIG (1035 TO 1380 kPa))

- A. Pipe NPS 2 (DN 50) and Smaller:
  1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.
  2. One piece, brass ball valve.
  3. One piece, bronze ball valve with bronze trim.
  4. Two-piece, brass ball valves with full port and brass trim.
  5. Two-piece, bronze ball valves with full port and bronze or brass trim.
  6. Three-piece, brass ball valves with full port and brass trim.
  7. Three-piece, bronze ball valves with full port and bronze or brass trim.
  8. Two-piece, bronze ball valves with regular port and bronze trim.
- B. Pipe NPS 2-1/2 (DN 65) and Larger:
  1. Steel and Iron Valves, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): May be provided with threaded ends instead of flanged ends.
  2. Class 150, steel ball valves with full port.
  3. Class 150, iron ball valves.

### 3.6 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

- A. Pipe NPS 2 (DN 50) and Smaller:
  1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.
  2. One piece, brass ball valve.
  3. One piece, bronze ball valve with bronze trim.
  4. Two-piece, brass ball valves with full port and brass trim.
  5. Two-piece, bronze ball valves with full port and bronze or brass trim.

6. Three-piece, brass ball valves with full port and brass trim.
  7. Three-piece, bronze ball valves with full port and bronze or brass trim.
  8. Two-piece, bronze ball valves with regular port and bronze trim.
- B. Pipe NPS 2-1/2 (DN 65) and Larger:
1. Steel and Iron Valves, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): May be provided with threaded ends instead of flanged ends.
  2. Class 150, steel ball valves with full port.
  3. Class 150, iron ball valves.

END OF SECTION 220523.12

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 220523.12 – BALL VALVES FOR PLUMBING PIPING

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the ball valves for plumbing piping are installed and are in general conformance with the Contract Documents, applicable Codes, and shop drawings. The ball valves for plumbing piping have been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

BALL VALVE FOR PLUMBING PIPING INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_



## SECTION 220523.13 - BUTTERFLY VALVES FOR PLUMBING PIPING

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Iron, single-flange butterfly valves.
  - 2. Iron, grooved-end butterfly valves.
  - 3. Chainwheels.

## 1.3 DEFINITIONS

- A. CWP: Cold working pressure.
- B. EPDM: Ethylene propylene-diene terpolymer rubber.
- C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

## 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of valve.
  - 1. Certification that products comply with NSF 61 Annex G and NSF 372.

## 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
  - 1. Protect internal parts against rust and corrosion.
  - 2. Protect threads, flange faces, grooves, and weld ends.
  - 3. Set butterfly valves closed or slightly open.
- B. Use the following precautions during storage:
  - 1. Maintain valve end protection.
  - 2. Store valves indoors and maintain at higher-than-ambient-dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.
- C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

## PART 2 - PRODUCTS

## 2.1 GENERAL REQUIREMENTS FOR VALVES

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.
- B. ASME Compliance:
  - 1. ASME B16.1 for flanges on iron valves.
  - 2. ASME B16.5 for flanges on steel valves.
  - 3. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
  - 4. ASME B31.9 for building service piping valves.
- C. AWWA Compliance: Comply with AWWA C606 for grooved-end connections.
- D. NSF Compliance: NSF 61 Annex G and NSF 372 for valve materials for potable-water service.
- E. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- F. Valve Sizes: Same as upstream piping unless otherwise indicated.
- G. Valve Actuator Types:
  - 1. Gear Actuator: For valves NPS 8 (DN 200) and larger.
  - 2. Handlever: For valves NPS 6 (DN 150) and smaller.
  - 3. Chainwheel: Device for attachment to gear, handlever, or stem; of size and with chain for mounting height, according to "Valve Installation" Article.
- H. Valves in Insulated Piping: With 2-inch (50-mm) stem extensions.

## 2.2 IRON, SINGLE-FLANGE BUTTERFLY VALVES

- A. Iron, Single-Flange Butterfly Valves with Aluminum-Bronze Disc:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Conbraco Industries, Inc.
    - b. Flo Fab inc.
    - c. Hammond Valve.
    - d. Jenkins Valves; Crane Energy Flow Solutions.
    - e. KITZ Corporation.
    - f. Legend Valve & Fitting, Inc.
    - g. Milwaukee Valve Company.
    - h. NIBCO INC.
    - i. Red-White Valve Corporation.
    - j. Watts; a Watts Water Technologies company.
  - 2. Description:
    - a. Standard: MSS SP-67, Type I.
    - b. CWP Rating: 200 psig (1380 kPa).
    - c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
    - d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
    - e. Seat: EPDM.
    - f. Stem: One- or two-piece stainless steel.

- g. Disc: Aluminum bronze.
- B. Iron, Single-Flange Butterfly Valves with Ductile-Iron Disc:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. American Valve, Inc.
    - b. Conbraco Industries, Inc.
    - c. Flo Fab inc.
    - d. Hammond Valve.
    - e. Jenkins Valves; Crane Energy Flow Solutions.
    - f. Jomar Valve.
    - g. Legend Valve & Fitting, Inc.
    - h. Milwaukee Valve Company.
    - i. NIBCO INC.
    - j. Sure Flow Equipment Inc.
    - k. Watts; a Watts Water Technologies company.
  - 2. Description:
    - a. Standard: MSS SP-67, Type I.
    - b. CWP Rating: 200 psig (1380 kPa).
    - c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
    - d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
    - e. Seat: EPDM.
    - f. Stem: One- or two-piece stainless steel.
    - g. Disc: Nickel-plated or -coated ductile iron.
- C. Iron, Single-Flange Butterfly Valves with Stainless-Steel Disc:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. American Valve, Inc.
    - b. Conbraco Industries, Inc.
    - c. Flo Fab inc.
    - d. Hammond Valve.
    - e. Jenkins Valves; Crane Energy Flow Solutions.
    - f. KITZ Corporation.
    - g. Legend Valve & Fitting, Inc.
    - h. Milwaukee Valve Company.
    - i. NIBCO INC.
    - j. Norriseal.
    - k. Red-White Valve Corporation.
    - l. Sure Flow Equipment Inc.
    - m. Watts; a Watts Water Technologies company.
  - 2. Description:
    - a. Standard: MSS SP-67, Type I.
    - b. CWP Rating, NPS 12 (DN 300) and Smaller: 200 psig (1380 kPa).
    - c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
    - d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
    - e. Seat: EPDM.
    - f. Stem: One- or two-piece stainless steel.
    - g. Disc: Stainless steel.

## 2.3 DUCTILE-IRON, GROOVED-END BUTTERFLY VALVES

- A. 175 CWP, Iron, Grooved-End Butterfly Valves:

### BUTTERFLY VALVES FOR PLUMBING PIPING

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Kennedy Valve Company; a division of McWane, Inc.
    - b. Shurjoint Piping Products.
    - c. Tyco Fire Products LP.
    - d. Victaulic Company.
    - e. Zurn Industries, LLC.
  2. Description:
    - a. Standard: MSS SP-67, Type I.
    - b. CWP Rating: 175 psig (1200 kPa).
    - c. Body Material: Coated, ductile iron.
    - d. Stem: Two-piece stainless steel.
    - e. Disc: Coated, ductile iron.
    - f. Seal: EPDM.
- B. 300 CWP, Iron, Grooved-End Butterfly Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Anvil International.
    - b. Kennedy Valve Company; a division of McWane, Inc.
    - c. Mueller Steam Specialty.
    - d. NIBCO INC.
    - e. Shurjoint Piping Products.
    - f. Tyco Fire Products LP.
    - g. Victaulic Company.
  2. Description:
    - a. Standard: MSS SP-67, Type I.
    - b. CWP Rating, NPS 8 (DN 200) and Smaller: 300 psig (2070 kPa).
    - c. CWP Rating, NPS 10 (DN 250) and Larger: 200 psig (1380 kPa).
    - d. Body Material: Coated, ductile iron.
    - e. Stem: Two-piece stainless steel.
    - f. Disc: Coated, ductile iron.
    - g. Seal: EPDM.

## 2.4 CHAINWHEELS

- 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. Babbitt Steam Specialty Co.
  2. Roto Hammer Industries.
  3. Trumbull Industries.
- B. Description: Valve actuation assembly with sprocket rim, chain guides, chain, and attachment brackets for mounting chainwheels directly to handwheels.
1. Sprocket Rim with Chain Guides: Ductile iron, of type and size required for valve. Include zinc or epoxy coating.
  2. Chain: Hot-dip, galvanized steel, of size required to fit sprocket rim.



## PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine mating flange faces for damage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- D. Do not attempt to repair defective valves; replace with new valves.

## 3.2 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.
- E. Install chainwheels on operators for butterfly valves NPS 4 (DN 100) and larger and more than 96 inches (2400 mm) above floor. Extend chains to 60 inches (1520 mm) above finished floor.
- F. Install valve tags. Comply with requirements in Section 220553 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

## 3.3 ADJUSTING

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

## 3.4 LOW-PRESSURE, COMPRESSED-AIR VALVE SCHEDULE (150 PSIG (1035 kPa) OR LESS)

- A. Iron, Single-Flange Butterfly Valves: 200 CWP, NBR seat, aluminum-bronze disc.
- B. Ductile-Iron, Grooved-End Butterfly Valves: 175 CWP.

## 3.5 HIGH-PRESSURE, COMPRESSED-AIR VALVE SCHEDULE (150 TO 200 PSIG (1035 TO 1380 kPa))

- A. Iron, Single-Flange Butterfly Valves: 200 CWP, NBR seat, aluminum-bronze disc.

- B. Ductile-Iron, Grooved-End Butterfly Valves: 175 CWP.

### 3.6 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

- A. Iron, Single-Flange Butterfly Valves: 200 CWP, EPDM seat, aluminum-bronze disc.
- B. Ductile-Iron, Grooved-End Butterfly Valves: 175 CWP.

END OF SECTION 220523.13

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 220523.13 – BUTTERFLY VALVES FOR PLUMBING PIPING

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the butterfly valves for plumbing piping are installed and are in general conformance with the Contract Documents, applicable Codes, and shop drawings. The butterfly valves for plumbing piping have been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

BUTTERFLY VALVES FOR PLUMBING PIPING INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address) Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address) Phone Number: (    ) \_\_\_\_\_



## SECTION 220523.14 - CHECK VALVES FOR PLUMBING PIPING

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Bronze lift check valves.
  - 2. Bronze swing check valves.
  - 3. Iron swing check valves.
  - 4. Iron swing check valves with closure control.
  - 5. Iron, grooved-end swing check valves.
  - 6. Iron, center-guided check valves.
  - 7. Iron, plate-type check valves.

## 1.3 DEFINITIONS

- A. CWP: Cold working pressure.
- B. EPDM: Ethylene propylene-diene terpolymer rubber.
- C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

## 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of valve.
  - 1. Certification that products comply with NSF 61 Annex G and NSF 372.

## 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
  - 1. Protect internal parts against rust and corrosion.
  - 2. Protect threads, flange faces, grooves, and weld ends.
  - 3. Set check valves in either closed or open position.
- B. Use the following precautions during storage:
  - 1. Maintain valve end protection.
  - 2. Store valves indoors and maintain at higher-than-ambient-dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.
- C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

## PART 2 - PRODUCTS

## 2.1 GENERAL REQUIREMENTS FOR VALVES

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.
- B. ASME Compliance:
  - 1. ASME B1.20.1 for threads for threaded end valves.
  - 2. ASME B16.1 for flanges on iron valves.
  - 3. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
  - 4. ASME B16.18 for solder joint.
  - 5. ASME B31.9 for building services piping valves.
- C. AWWA Compliance: Comply with AWWA C606 for grooved-end connections.
- D. NSF Compliance: NSF 61 Annex G and NSF 372 for valve materials for potable-water service.
- E. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.
- F. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- G. Valve Sizes: Same as upstream piping unless otherwise indicated.
- H. Valve Bypass and Drain Connections: MSS SP-45.

## 2.2 BRONZE LIFT CHECK VALVES

- A. Class 125, Lift Check Valves with Bronze Disc:
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Crane; Crane Energy Flow Solutions.
    - b. Jenkins Valves; Crane Energy Flow Solutions.
    - c. Stockham; Crane Energy Flow Solutions.
  - 2. Description:
    - a. Standard: MSS SP-80, Type 1.
    - b. CWP Rating: 200 psig (1380 kPa).
    - c. Body Design: Vertical flow.
    - d. Body Material: ASTM B 61 or ASTM B 62, bronze.
    - e. Ends: Threaded or soldered. See valve schedule articles.
    - f. Disc: Bronze.
- B. Class 125, Lift Check Valves with Nonmetallic Disc:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Flo Fab inc.
    - b. Hammond Valve.
    - c. KITZ Corporation.
    - d. Milwaukee Valve Company.
    - e. Mueller Steam Specialty.

- f. NIBCO INC.
  - g. Red-White Valve Corporation.
  - h. Watts; a Watts Water Technologies company.
- 2. Description:
  - a. Standard: MSS SP-80, Type 2.
  - b. CWP Rating: 200 psig (1380 kPa).
  - c. Body Design: Vertical flow.
  - d. Body Material: ASTM B 61 or ASTM B 62, bronze.
  - e. Ends: Threaded or soldered. See valve schedule articles.
  - f. Disc: NBR, PTFE.

### 2.3 BRONZE SWING CHECK VALVES

- A. Class 125, Bronze, Swing Check Valves with Bronze Disc:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. American Valve, Inc.
    - b. Crane; Crane Energy Flow Solutions.
    - c. Hammond Valve.
    - d. Jenkins Valves; Crane Energy Flow Solutions.
    - e. KITZ Corporation.
    - f. Macomb Groups (The).
    - g. Milwaukee Valve Company.
    - h. NIBCO INC.
    - i. Powell Valves.
    - j. Red-White Valve Corporation.
    - k. Stockham; Crane Energy Flow Solutions.
    - l. Watts; a Watts Water Technologies company.
  - 2. Description:
    - a. Standard: MSS SP-80, Type 3.
    - b. CWP Rating: 200 psig (1380 kPa).
    - c. Body Design: Horizontal flow.
    - d. Body Material: ASTM B 62, bronze.
    - e. Ends: Threaded or soldered. See valve schedule articles.
    - f. Disc: Bronze.
- B. Class 125, Bronze Swing Check Valves with Nonmetallic Disc:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Crane; Crane Energy Flow Solutions.
    - b. Hammond Valve.
    - c. Jenkins Valves; Crane Energy Flow Solutions.
    - d. KITZ Corporation.
    - e. Milwaukee Valve Company.
    - f. NIBCO INC.
    - g. Red-White Valve Corporation.
    - h. Stockham; Crane Energy Flow Solutions.
    - i. Watts; a Watts Water Technologies company.
  - 2. Description:
    - a. Standard: MSS SP-80, Type 4.
    - b. CWP Rating: 200 psig (1380 kPa).
    - c. Body Design: Horizontal flow.
    - d. Body Material: ASTM B 62, bronze.
    - e. Ends: Threaded or soldered. See valve schedule articles.
    - f. Disc: PTFE.

- C. Class 150, Bronze Swing Check Valves with Bronze Disc:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. American Valve, Inc.
    - b. Crane; Crane Energy Flow Solutions.
    - c. Jenkins Valves; Crane Energy Flow Solutions.
    - d. Jomar Valve.
    - e. KITZ Corporation.
    - f. Macomb Groups (The).
    - g. Milwaukee Valve Company.
    - h. NIBCO INC.
    - i. Red-White Valve Corporation.
    - j. Stockham; Crane Energy Flow Solutions.
  2. Description:
    - a. Standard: MSS SP-80, Type 3.
    - b. CWP Rating: 300 psig (2070 kPa).
    - c. Body Design: Horizontal flow.
    - d. Body Material: ASTM B 62, bronze.
    - e. Ends: Threaded or soldered. See valve schedule articles.
    - f. Disc: Bronze.
- D. Class 150, Bronze Swing Check Valves with Nonmetallic Disc:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Crane; Crane Energy Flow Solutions.
    - b. Hammond Valve.
    - c. Jenkins Valves; Crane Energy Flow Solutions.
    - d. Milwaukee Valve Company.
    - e. NIBCO INC.
    - f. Watts; a Watts Water Technologies company.
  2. Description:
    - a. Standard: MSS SP-80, Type 4.
    - b. CWP Rating: 300 psig (2070 kPa).
    - c. Body Design: Horizontal flow.
    - d. Body Material: ASTM B 62, bronze.
    - e. Ends: Threaded or soldered. See valve schedule articles.
    - f. Disc: PTFE.

## 2.4 IRON SWING CHECK VALVES

- A. Class 125, Iron Swing Check Valves with Metal Seats:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Crane; Crane Energy Flow Solutions.
    - b. Hammond Valve.
    - c. Jenkins Valves; Crane Energy Flow Solutions.
    - d. KITZ Corporation.
    - e. Legend Valve & Fitting, Inc.
    - f. Macomb Groups (The).
    - g. Milwaukee Valve Company.
    - h. NIBCO INC.
    - i. Powell Valves.
    - j. Red-White Valve Corporation.
    - k. Stockham; Crane Energy Flow Solutions.
    - l. Sure Flow Equipment Inc.



- m. Watts; a Watts Water Technologies company.
- 2. Description:
  - a. Standard: MSS SP-71, Type I.
  - b. CWP Rating: 200 psig (1380 kPa).
  - c. Body Design: Clear or full waterway.
  - d. Body Material: ASTM A 126, gray iron with bolted bonnet.
  - e. Ends: Flanged or threaded. See valve schedule articles.
  - f. Trim: Bronze.
  - g. Gasket: Asbestos free.
- B. Class 125, Iron Swing Check Valves with Nonmetallic-to-Metal Seats:
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Crane; Crane Energy Flow Solutions.
    - b. Stockham; Crane Energy Flow Solutions.
  - 2. Description:
    - a. Standard: MSS SP-71, Type I.
    - b. CWP Rating: 200 psig (1380 kPa).
    - c. Body Design: Clear or full waterway.
    - d. Body Material: ASTM A 126, gray iron with bolted bonnet.
    - e. Ends: Flanged or threaded. See valve schedule articles.
    - f. Trim: Composition.
    - g. Seat Ring: Bronze.
    - h. Disc Holder: Bronze.
    - i. Disc: PTFE.
    - j. Gasket: Asbestos free.

## 2.5 IRON, GROOVED-END SWING CHECK VALVES

- A. 300 CWP, Iron, Grooved-End Swing Check Valves:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Anvil International.
    - b. Shurjoint Piping Products.
    - c. Tyco Fire Products LP.
    - d. Victaulic Company.
  - 2. Description:
    - a. CWP Rating: 300 psig (2070 kPa).
    - b. Body Material: ASTM A 536, ductile iron.
    - c. Seal: EPDM.
    - d. Disc: Spring operated, ductile iron or stainless steel.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine threads on valve and mating pipe for form and cleanliness.
- D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- E. Do not attempt to repair defective valves; replace with new valves.

### 3.2 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.
- E. Install check valves for proper direction of flow and as follows:
  - 1. Swing Check Valves: In horizontal position with hinge pin level.
  - 2. Center-Guided and Plate-Type Check Valves: In horizontal or vertical position, between flanges.
  - 3. Lift Check Valves: With stem upright and plumb.
- F. Install valve tags. Comply with requirements in Section 220553 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

### 3.3 ADJUSTING

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

### 3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valve applications are not indicated, use the following:
  - 1. Pump-Discharge Check Valves:
    - a. NPS 2 (DN 50) and Smaller: Bronze swing check valves with bronze or nonmetallic disc.
    - b. NPS 2-1/2 (DN 65) and Larger for Domestic Water: Iron swing check valves with lever and weight or spring; or iron, center-guided, metal-seat or resilient-seat check valves.
    - c. NPS 2-1/2 (DN 65) and Larger for Sanitary Waste and Storm Drainage: Iron swing check valves with lever and weight or spring.
- B. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.
- C. End Connections:

1. For Copper Tubing, NPS 2 (DN 50) and Smaller: Threaded or soldered.
2. For Copper Tubing, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Flanged or threaded.
3. For Copper Tubing, NPS 5 (DN 125) and Larger: Flanged.
4. For Steel Piping, NPS 2 (DN 50) and Smaller: Threaded.
5. For Steel Piping, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Flanged or threaded.
6. For Steel Piping, NPS 5 (DN 125) and Larger: Flanged.
7. For Grooved-End Copper Tubing and Steel Piping: Grooved.

### 3.5 LOW-PRESSURE, COMPRESSED-AIR VALVE SCHEDULE (150 PSIG (1035 kPa) OR LESS)

- A. Pipe NPS 2 (DN 50) and Smaller:
  1. Vertical, Upflow Applications Only: Bronze lift check valves, Class 125, bronze disc with soldered or threaded end connections.
  2. Horizontal and Vertical Applications: Bronze swing check valves, Class 125, bronze disc with soldered or threaded end connections.
- B. Pipe NPS 2-1/2 (DN 65) and Larger:
  1. Iron swing check valves, Class 125, nonmetallic-to-metal seats with threaded or flanged end connections.
  2. Iron, grooved-end swing check valves, 300 CWP.
  3. Iron, dual-plate check valves, Class 125, metal seat with flanged end connections.
  4. Iron, single-plate check valves, Class 125, resilient seat with flanged end connections.

### 3.6 HIGH-PRESSURE, COMPRESSED-AIR VALVE SCHEDULE (150 TO 200 PSIG (1035 TO 1380 kPa))

- A. Pipe NPS 2 (DN 50) and Smaller:
  1. Vertical, Upflow Applications Only: Bronze lift check valves, Class 125, bronze disc with soldered or threaded end connections.
  2. Horizontal and Vertical Applications: Bronze swing check valves, Class 125, bronze disc with soldered or threaded end connections.
- B. Pipe NPS 2-1/2 (DN 65) and Larger:
  1. Iron swing check valves, Class 125, metal seats with flanged end connections.
  2. Iron, grooved-end swing check valves, 300 CWP with flanged end connections.
  3. Iron, dual-plate check valves, Class 150, resilient seat with flanged end connections.
  4. Iron, single-plate check valves, Class 125, resilient seat with flanged end connections.

### 3.7 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

- A. Pipe NPS 2 (DN 50) and Smaller: Bronze swing check valves, Class 125, bronze disc with soldered or threaded end connections.
- B. Pipe NPS 2-1/2 (DN 65) and Larger:
  1. Iron swing check valves, Class 125, metal seats with flanged end connections.
  2. Iron, grooved-end swing check valves, 300 CWP.
  3. Iron, dual-plate check valves, Class 125, metal seat with flanged end connections.
  4. Iron, single-plate check valves, Class 125, resilient seat with flanged end connections.

END OF SECTION 220523.14

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 220523.14 – CHECK VALVES FOR PLUMBING PIPING

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the check valves for plumbing piping are installed and are in general conformance with the Contract Documents, applicable Codes, and shop drawings. The check valves for plumbing piping have been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

CHECK VALVES FOR PLUMBING PIPING INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_

## SECTION 220523.15 - GATE VALVES FOR PLUMBING PIPING

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Bronze gate valves.
  - 2. Iron gate valves.
  - 3. Chainwheels.

## 1.3 DEFINITIONS

- A. CWP: Cold working pressure.
- B. NRS: Nonrising stem.
- C. OS&Y: Outside screw and yoke.
- D. RS: Rising stem.

## 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of valve.
  - 1. Certification that products comply with NSF 61 Annex G and NSF 372.

## 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
  - 1. Protect internal parts against rust and corrosion.
  - 2. Protect threads, flange faces, grooves, and weld ends.
  - 3. Set gate valves closed to prevent rattling.
- B. Use the following precautions during storage:
  - 1. Maintain valve end protection.
  - 2. Store valves indoors and maintain at higher-than-ambient-dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.
- C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

## PART 2 - PRODUCTS

## 2.1 GENERAL REQUIREMENTS FOR VALVES

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.
- B. ASME Compliance:
  - 1. ASME B1.20.1 for threads for threaded end valves.
  - 2. ASME B16.1 for flanges on iron valves.
  - 3. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
  - 4. ASME B16.18 for solder joint.
  - 5. ASME B31.9 for building services piping valves.
- C. NSF Compliance: NSF 61 Annex G and NSF 372 for valve materials for potable-water service.
- D. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.
- E. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- F. Valve Sizes: Same as upstream piping unless otherwise indicated.
- G. RS Valves in Insulated Piping: With 2-inch (50-mm) stem extensions.
- H. Valve Bypass and Drain Connections: MSS SP-45.

## 2.2 BRONZE GATE VALVES

- A. Class 125, NRS, Bronze Gate Valves:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. American Valve, Inc.
    - b. Crane; Crane Energy Flow Solutions.
    - c. Hammond Valve.
    - d. Jenkins Valves; Crane Energy Flow Solutions.
    - e. Jomar Valve.
    - f. KITZ Corporation.
    - g. Macomb Groups (The).
    - h. Milwaukee Valve Company.
    - i. NIBCO INC.
    - j. Powell Valves.
    - k. Red-White Valve Corporation.
    - l. Stockham; Crane Energy Flow Solutions.
    - m. Watts; a Watts Water Technologies company.
  - 2. Description:
    - a. Standard: MSS SP-80, Type 1.
    - b. CWP Rating: 200 psig (1380 kPa).
    - c. Body Material: Bronze with integral seat and screw-in bonnet.
    - d. Ends: Threaded or solder joint.
    - e. Stem: Bronze.
    - f. Disc: Solid wedge; bronze.

- g. Packing: Asbestos free.
  - h. Handwheel: Malleable iron, bronze, or aluminum.
- B. Class 125, RS, Bronze Gate Valves:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. American Valve, Inc.
    - b. Crane; Crane Energy Flow Solutions.
    - c. Hammond Valve.
    - d. Jenkins Valves; Crane Energy Flow Solutions.
    - e. KITZ Corporation.
    - f. Macomb Groups (The).
    - g. Milwaukee Valve Company.
    - h. NIBCO INC.
    - i. Powell Valves.
    - j. Stockham; Crane Energy Flow Solutions.
    - k. Watts; a Watts Water Technologies company.
  - 2. Description:
    - a. Standard: MSS SP-80, Type 2.
    - b. CWP Rating: 200 psig (1380 kPa).
    - c. Body Material: Bronze with integral seat and screw-in bonnet.
    - d. Ends: Threaded or solder joint.
    - e. Stem: Bronze.
    - f. Disc: Solid wedge; bronze.
    - g. Packing: Asbestos free.
    - h. Handwheel: Malleable iron, bronze, or aluminum.
- C. Class 150, NRS, Bronze Gate Valves:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Hammond Valve.
    - b. KITZ Corporation.
    - c. Milwaukee Valve Company.
    - d. NIBCO INC.
    - e. Powell Valves.
    - f. Red-White Valve Corporation.
    - g. Watts; a Watts Water Technologies company.
  - 2. Description:
    - a. Standard: MSS SP-80, Type 1.
    - b. CWP Rating: 300 psig (2070 kPa).
    - c. Body Material: Bronze with integral seat and union-ring bonnet.
    - d. Ends: Threaded.
    - e. Stem: Bronze.
    - f. Disc: Solid wedge; bronze.
    - g. Packing: Asbestos free.
    - h. Handwheel: Malleable iron, bronze, or aluminum.
- D. Class 150, RS, Bronze Gate Valves:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Crane; Crane Energy Flow Solutions.
    - b. Hammond Valve.
    - c. KITZ Corporation.
    - d. Macomb Groups (The).
    - e. Milwaukee Valve Company.
    - f. NIBCO INC.

- g. Powell Valves.
- h. Stockham; Crane Energy Flow Solutions.
- i. Watts; a Watts Water Technologies company.
- 2. Description:
  - a. Standard: MSS SP-80, Type 2.
  - b. CWP Rating: 300 psig (2070 kPa).
  - c. Body Material: Bronze with integral seat and union-ring bonnet.
  - d. Ends: Threaded.
  - e. Stem: Bronze.
  - f. Disc: Solid wedge; bronze.
  - g. Packing: Asbestos free.
  - h. Handwheel: Malleable iron, bronze, or aluminum.

### 2.3 IRON GATE VALVES

#### A. Class 125, NRS, Iron Gate Valves:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Crane; Crane Energy Flow Solutions.
  - b. Flo Fab inc.
  - c. Hammond Valve.
  - d. Jenkins Valves; Crane Energy Flow Solutions.
  - e. KITZ Corporation.
  - f. Legend Valve & Fitting, Inc.
  - g. Macomb Groups (The).
  - h. Milwaukee Valve Company.
  - i. NIBCO INC.
  - j. Powell Valves.
  - k. Red-White Valve Corporation.
  - l. Stockham; Crane Energy Flow Solutions.
  - m. Watts; a Watts Water Technologies company.
  - n. Zurn Industries, LLC.
- 2. Description:
  - a. Standard: MSS SP-70, Type I.
  - b. CWP Rating: 200 psig (1380 kPa).
  - c. Body Material: Gray iron with bolted bonnet.
  - d. Ends: Flanged.
  - e. Trim: Bronze.
  - f. Disc: Solid wedge.
  - g. Packing and Gasket: Asbestos free.

#### B. Class 125, OS&Y, Iron Gate Valves:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Crane; Crane Energy Flow Solutions.
  - b. Flo Fab inc.
  - c. Hammond Valve.
  - d. Jenkins Valves; Crane Energy Flow Solutions.
  - e. KITZ Corporation.
  - f. Legend Valve & Fitting, Inc.
  - g. Macomb Groups (The).
  - h. Milwaukee Valve Company.
  - i. NIBCO INC.
  - j. Powell Valves.
  - k. Red-White Valve Corporation.



- I. Stockham; Crane Energy Flow Solutions.
    - m. Watts; a Watts Water Technologies company.
  - 2. Description:
    - a. Standard: MSS SP-70, Type I.
    - b. CWP Rating: 200 psig (1380 kPa).
    - c. Body Material: Gray iron with bolted bonnet.
    - d. Ends: Flanged.
    - e. Trim: Bronze.
    - f. Disc: Solid wedge.
    - g. Packing and Gasket: Asbestos free.

## 2.4 CHAINWHEELS

- 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. Babbitt Steam Specialty Co.
  - 2. Roto Hammer Industries.
  - 3. Trumbull Industries.
- B. Description: Valve actuation assembly with sprocket rim, chain guides, chain, and attachment brackets for mounting chainwheels directly to hand wheels.
  - 1. Sprocket Rim with Chain Guides: Ductile iron, of type and size required for valve. Include zinc or epoxy coating.
  - 2. Chain: Hot-dip galvanized steel, of size required to fit sprocket rim.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine threads on valve and mating pipe for form and cleanliness.
- D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- E. Do not attempt to repair defective valves; replace with new valves.

### 3.2 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.

- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.
- E. Install chainwheels on operators for gate valves NPS 4 (DN 100) and larger and more than 96 inches (2400 mm) above floor. Extend chains to 60 inches (1520 mm) above finished floor.
- F. Install valve tags. Comply with requirements in Section 220553 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

### 3.3 ADJUSTING

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

### 3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. Use gate valves for shutoff service only.
- B. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.
- C. For Grooved-End Copper Tubing and Steel Piping: Valve ends may be grooved.

### 3.5 LOW-PRESSURE, COMPRESSED-AIR VALVE SCHEDULE (150 PSIG ([1035 kPa]) OR LESS)

- A. Pipe NPS 2 (DN 50) and Smaller: Bronze gate valves, Class 125, NRS with threaded ends.
- B. Pipe NPS 2-1/2 (DN 65) and Larger: Iron gate valves, Class 125, OS&Y with flanged ends.

### 3.6 HIGH-PRESSURE, COMPRESSED-AIR VALVE SCHEDULE (150 TO 200 PSIG ([1035 TO 1380 kPa]))

- A. Pipe NPS 2 (DN 50) and Smaller: Bronze gate valves, Class 150, NRS with threaded ends.
- B. Pipe NPS 2-1/2 (DN 65) and Larger: Iron gate valves, Class 125, OS&Y with flanged ends.

### 3.7 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

- A. Pipe NPS 2 (DN 50) and Smaller: Bronze gate valves, Class 125, NRS with soldered ends.
- B. Pipe NPS 2-1/2 (DN 65) and Larger: Iron gate valves, Class 125, OS&Y with flanged ends.

END OF SECTION 220523.15

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 220523.15 – GATE VALVES FOR PLUMBING PIPING

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the gate valves for plumbing piping are installed and are in general conformance with the Contract Documents, applicable Codes, and shop drawings. The gate valves for plumbing piping have been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

GATE VALVES FOR PLUMBING PIPING INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_



## SECTION 220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Metal pipe hangers and supports.
  - 2. Trapeze pipe hangers.
  - 3. Metal framing systems.
  - 4. Thermal-hanger shield inserts.
  - 5. Fastener systems.
  - 6. Pipe stands.
  - 7. Pipe positioning systems.
  - 8. Equipment supports.
- B. Related Sections:
  - 1. Section 055000 "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.

## 1.3 DEFINITIONS

- A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

## 1.4 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
  - 1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
  - 2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
  - 3. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

## 1.5 ACTION SUBMITTALS

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

## 1.6 QUALITY ASSURANCE

- A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

## PART 2 - PRODUCTS

### 2.1 METAL PIPE HANGERS AND SUPPORTS

- A. Carbon-Steel Pipe Hangers and Supports:
  - 1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
  - 2. Galvanized Metallic Coatings: Pre-galvanized or hot dipped.
  - 3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
  - 4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
  - 5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
- B. Stainless-Steel Pipe Hangers and Supports:
  - 1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
  - 2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
  - 3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.
- C. Copper Pipe Hangers:
  - 1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
  - 2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

### 2.2 TRAPEZE PIPE HANGERS

- A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

### 2.3 METAL FRAMING SYSTEMS

- A. MFMA Manufacturer Metal Framing Systems:
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Allied Tube & Conduit; a part of Atkore International.
    - b. B-line, an Eaton business.
    - c. Flex-Strut Inc.
    - d. Thomas & Betts Corporation, A Member of the ABB Group.
    - e. Unistrut; Part of Atkore International.
    - f. Wesanco, Inc.
  - 2. Description: Shop- or field-fabricated pipe-support assembly for supporting multiple parallel pipes.

3. Standard: MFMA-4.
  4. Channels: Continuous slotted steel channel with inturned lips.
  5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
  6. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
- B. Non-MFMA Manufacturer Metal Framing Systems:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Anvil International.
    - b. Empire Industries, Inc.
    - c. ERICO International Corporation.
    - d. Haydon Corporation.
    - e. NIBCO INC.
    - f. PHD Manufacturing, Inc.
    - g. PHS Industries, Inc.
  2. Description: Shop- or field-fabricated pipe-support assembly made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.
  3. Standard: Comply with MFMA-4.
  4. Channels: Continuous slotted steel channel with inturned lips.
  5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
  6. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
  7. Coating: Zinc.

## 2.4 THERMAL-HANGER SHIELD INSERTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Carpenter & Paterson, Inc.
  2. Clement Support Services.
  3. ERICO International Corporation.
  4. National Pipe Hanger Corporation.
  5. PHS Industries, Inc.
  6. Pipe Shields Inc.
  7. Piping Technology & Products, Inc.
  8. Rilco Manufacturing Co., Inc.
  9. Value Engineered Products, Inc.
- B. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig (688-kPa) or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig (862-kPa) minimum compressive strength and vapor barrier.
- C. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass with 100-psig (688-kPa) or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig (862-kPa) minimum compressive strength.
- D. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- E. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- F. Insert Length: Extend 2 inches (50 mm) beyond sheet metal shield for piping operating below ambient air temperature.

## 2.5 FASTENER SYSTEMS

- A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
- B. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

## 2.6 PIPE STANDS

- A. General Requirements for Pipe Stands: Shop- or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.
- B. Compact Pipe Stand: One-piece plastic unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.
- C. Low-Type, Single-Pipe Stand: One-piece plastic base unit with plastic roller, for roof installation without membrane penetration.
- D. High-Type, Single-Pipe Stand:
  - 1. Description: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.
  - 2. Base: Plastic.
  - 3. Vertical Members: Two or more cadmium-plated-steel or stainless-steel, continuous-thread rods.
  - 4. Horizontal Member: Cadmium-plated-steel or stainless-steel rod with plastic or stainless-steel, roller-type pipe support.
- E. High-Type, Multiple-Pipe Stand:
  - 1. Description: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.
  - 2. Bases: One or more; plastic.
  - 3. Vertical Members: Two or more protective-coated-steel channels.
  - 4. Horizontal Member: Protective-coated-steel channel.
  - 5. Pipe Supports: Galvanized-steel, clevis-type pipe hangers.
- F. Curb-Mounting-Type Pipe Stands: Shop- or field-fabricated pipe supports made from structural-steel shapes, continuous-thread rods, and rollers, for mounting on permanent stationary roof curb.

## 2.7 PIPE POSITIONING SYSTEMS

- A. Description: IAPMO PS 42, positioning system of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

## 2.8 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.



## 2.9 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
  - 1. Properties: Nonstaining, noncorrosive, and nongaseous.
  - 2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

## PART 3 - EXECUTION

### 3.1 HANGER AND SUPPORT INSTALLATION

- A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.
- B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
  - 1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
  - 2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.
- C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.
- D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- E. Fastener System Installation:
  - 1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches (100 mm) thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
  - 2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- F. Pipe Stand Installation:
  - 1. Pipe Stand Types except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
  - 2. Curb-Mounted-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. See Section 077200 "Roof Accessories" for curbs.
- G. Pipe Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.
- H. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

- I. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- J. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- K. Install lateral bracing with pipe hangers and supports to prevent swaying.
- L. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 (DN 65) and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- M. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- N. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.
- O. Insulated Piping:
  - 1. Attach clamps and spacers to piping.
    - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
    - c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
  - 2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
    - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.
  - 3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
    - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.
  - 4. Shield Dimensions for Pipe: Not less than the following:
    - a. NPS 1/4 to NPS 3-1/2 (DN 8 to DN 90): 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.
    - b. NPS 4 (DN 100): 12 inches (305 mm) long and 0.06 inch (1.52 mm) thick.
    - c. NPS 5 and NPS 6 (DN 125 and DN 150): 18 inches (457 mm) long and 0.06 inch (1.52 mm) thick.
    - d. NPS 8 to NPS 14 (DN 200 to DN 350): 24 inches (610 mm) long and 0.075 inch (1.91 mm) thick.
    - e. NPS 16 to NPS 24 (DN 400 to DN 600): 24 inches (610 mm) long and 0.105 inch (2.67 mm) thick.
  - 5. Pipes NPS 8 (DN 200) and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
  - 6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

### 3.2 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

- B. Grouting: Place grout under supports for equipment and make bearing surface smooth.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

### 3.3 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

### 3.4 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches (40 mm).

### 3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
  - 1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils (0.05 mm).
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

### 3.6 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use carbon-steel pipe hangers and supports and metal framing systems and attachments for general service applications.
- F. Use stainless-steel pipe hangers and stainless-steel or corrosion-resistant attachments for hostile environment applications.
- G. Use copper-plated pipe hangers and copper or stainless-steel attachments for copper piping and tubing.
- H. Use padded hangers for piping that is subject to scratching.
- I. Use thermal-hanger shield inserts for insulated piping and tubing.
- J. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
  - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).
  - 2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F (566 deg C), pipes NPS 4 to NPS 24 (DN 100 to DN 600), requiring up to 4 inches (100 mm) of insulation.
  - 3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36 (DN 20 to DN 900), requiring clamp flexibility and up to 4 inches (100 mm) of insulation.
  - 4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 (DN 15 to DN 600) if little or no insulation is required.
  - 5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4 (DN 15 to DN 100), to allow off-center closure for hanger installation before pipe erection.
  - 6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8 (DN 20 to DN 200).
  - 7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
  - 8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
  - 9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
  - 10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8 (DN 10 to DN 200).
  - 11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3 (DN 10 to DN 80).
  - 12. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).
  - 13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
  - 14. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36 (DN 100 to DN 900), with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
  - 15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36 (DN 100 to DN 900), with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
  - 16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 (DN 65 to DN 900) if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.

17. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30 (DN 25 to DN 750), from two rods if longitudinal movement caused by expansion and contraction might occur.
  18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24 (DN 65 to DN 600), from single rod if horizontal movement caused by expansion and contraction might occur.
  19. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 (DN 50 to DN 1050) if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
  20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 (DN 50 to DN 600) if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
  21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 (DN 50 to DN 750) if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.
- K. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24 (DN 24 to DN 600).
  2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 (DN 20 to DN 600) if longer ends are required for riser clamps.
- L. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches (150 mm) for heavy loads.
  2. Steel Clevises (MSS Type 14): For 120 to 450 deg F (49 to 232 deg C) piping installations.
  3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
  4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
  5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F (49 to 232 deg C) piping installations.
- M. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
  2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
  3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
  4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
  5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
  6. C-Clamps (MSS Type 23): For structural shapes.
  7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
  8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
  9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
  10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
  11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.

12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
    - a. Light (MSS Type 31): 750 lb (340 kg).
    - b. Medium (MSS Type 32): 1500 lb (680 kg).
    - c. Heavy (MSS Type 33): 3000 lb (1360 kg).
  13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
  14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
  15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.
- N. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
  2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
  3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- O. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
  2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches (32 mm).
  3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
  4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
  5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.
  6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.
  7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.
  8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:
    - a. Horizontal (MSS Type 54): Mounted horizontally.
    - b. Vertical (MSS Type 55): Mounted vertically.
    - c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.
- P. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.
- Q. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.
- R. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.
- S. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION 220529

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 220529 – HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the hangers and supports for plumbing piping and equipment are installed and are in general conformance with the Contract Documents, applicable Codes, and shop drawings. The hangers and supports for plumbing piping and equipment have been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_



## SECTION 220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

## 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. Equipment labels.
  - 2. Warning signs and labels.
  - 3. Pipe labels.
  - 4. Stencils.
  - 5. Valve tags.
  - 6. Warning tags.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For color, letter style, and graphic representation required for each identification material and device.
- C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.
- D. Valve numbering scheme.
- E. Valve Schedules: For each piping system to include in maintenance manuals.

## PART 2 - PRODUCTS

## 2.1 EQUIPMENT LABELS

- A. Metal Labels for Equipment:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Brady Corporation.
    - b. Brimar Industries, Inc.
    - c. Carlton Industries, LP.
    - d. Champion America.
    - e. Craftmark Pipe Markers.
    - f. emedco.
    - g. Kolbi Pipe Marker Co.
    - h. LEM Products Inc.

- i. Marking Services, Inc.
    - j. Seton Identification Products.
  2. Material and Thickness: Brass, 0.032-inch (0.8-mm) or anodized aluminum, 0.032-inch (0.8-mm) minimum thickness, and having predrilled or stamped holes for attachment hardware.
  3. Letter Color: Black.
  4. Background Color: White.
  5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).
  6. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
  7. Fasteners: Stainless-steel rivets or self-tapping screws.
  8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- B. Plastic Labels for Equipment:
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Brady Corporation.
    - b. Brimar Industries, Inc.
    - c. Carlton Industries, LP.
    - d. Champion America.
    - e. Craftmark Pipe Markers.
    - f. emedco.
    - g. Kolbi Pipe Marker Co.
    - h. LEM Products Inc.
    - i. Marking Services, Inc.
    - j. Seton Identification Products.
  2. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch (1.6 mm) thick, and having predrilled holes for attachment hardware.
  3. Letter Color: Black.
  4. Background Color: White.
  5. Maximum Temperature: Able to withstand temperatures up to 160 deg F (71 deg C).
  6. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).
  7. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
  8. Fasteners: Stainless-steel rivets or self-tapping screws.
  9. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.
- D. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch (A4) bond paper. Tabulate equipment identification number, and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

## 2.2 WARNING SIGNS AND LABELS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Brady Corporation.
  - 2. Brimar Industries, Inc.
  - 3. Carlton Industries, LP.
  - 4. Champion America.
  - 5. Craftmark Pipe Markers.
  - 6. emedco.
  - 7. LEM Products Inc.
  - 8. Marking Seivics Inc.
  - 9. National Marker Company.
  - 10. Seton Identification Products.
  - 11. Stranco, Inc.
- B. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch (1.6 mm) thick, and having predrilled holes for attachment hardware.
- C. Letter Color: Black.
- D. Background Color: White.
- E. Maximum Temperature: Able to withstand temperatures up to 160 deg F (71 deg C).
- F. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).
- G. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
- H. Fasteners: Stainless-steel rivets or self-tapping screws.
- I. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- J. Label Content: Include caution and warning information plus emergency notification instructions.

## 2.3 PIPE LABELS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Actioncraft Products, Inc.; a division of Industrial Test Equipment Co., Inc.
  - 2. Brady Corporation.
  - 3. Brimar Industries, Inc.
  - 4. Carlton Industries, LP.
  - 5. Champion America.
  - 6. Craftmark Pipe Markers.
  - 7. emedco.
  - 8. Kolbi Pipe Marker Co.
  - 9. LEM Products Inc.
  - 10. Marking Seivics Inc.
  - 11. Seton Identification Products.

- B. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
- C. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to partially cover circumference of pipe and to attach to pipe without fasteners or adhesive.
- D. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- E. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; also include pipe size and an arrow indicating flow direction.
  - 1. Flow-Direction Arrows: Integral with piping-system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
  - 2. Lettering Size: Size letters according to ASME A13.1 for piping.

## 2.4 STENCILS

- A. Stencils for Piping:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Brimar Industries, Inc.
    - b. Carlton Industries, LP.
    - c. Champion America.
    - d. Craftmark Pipe Markers.
    - e. Kolbi Pipe Marker Co.
    - f. Marking Services Inc.
  - 2. Lettering Size: Size letters according to ASME A13.1 for piping.
  - 3. Stencil Material: Aluminum.
  - 4. Stencil Paint: Exterior, gloss, acrylic enamel in colors complying with recommendations in ASME A13.1 unless otherwise indicated. Paint may be in pressurized spray-can form.
  - 5. Identification Paint: Exterior, acrylic enamel in colors according to ASME A13.1 unless otherwise indicated. Paint may be in pressurized spray-can form.

## 2.5 WARNING TAGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Brady Corporation.
  - 2. Brimar Industries, Inc.
  - 3. Carlton Industries, LP.
  - 4. Champion America.
  - 5. Craftmark Pipe Markers.
  - 6. emedco.
  - 7. Kolbi Pipe Marker Co.
  - 8. LEM Products Inc.
  - 9. Marking Services Inc.
  - 10. Seton Identification Products.
- B. Description: Preprinted or partially preprinted accident-prevention tags of plasticized card stock with matte finish suitable for writing.
  - 1. Size: Approximately 4 by 7 inches (100 by 178 mm).
  - 2. Fasteners: Reinforced grommet and wire or string.

3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
4. Color: Safety yellow background with black lettering.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

### 3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with locations of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

### 3.3 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

### 3.4 PIPE LABEL INSTALLATION

- A. Piping Color Coding: Painting of piping is specified in Section 099000 "Painting and Coating."
- B. Stenciled Pipe Label Option: Stenciled labels may be provided instead of manufactured pipe labels, at Installer's option. Install stenciled pipe labels, complying with ASME A13.1, with painted, color-coded bands or rectangles on each piping system.
  1. Identification Paint: Use for contrasting background.
  2. Stencil Paint: Use for pipe marking.
- C. Pipe Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
  1. Near each valve and control device.
  2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
  3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
  4. At access doors, manholes, and similar access points that permit view of concealed piping.
  5. Near major equipment items and other points of origination and termination.
  6. Spaced at maximum intervals of 50 feet (15 m) along each run. Reduce intervals to 25 feet (7.6 m) in areas of congested piping and equipment.
  7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

- D. Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.
- E. Pipe Label Color Schedule:
  - 1. Low-Pressure Compressed Air Piping:
    - a. Background: Safety blue.
    - b. Letter Colors: White.
  - 2. High-Pressure Compressed Air Piping:
    - a. Background: Safety blue.
    - b. Letter Colors: White.
  - 3. Domestic Water Piping
    - a. Background: Safety green.
    - b. Letter Colors: White.
  - 4. Sanitary Waste and Storm Drainage Piping:
    - a. Background Color: Safety white.
    - b. Letter Color: Black.

### 3.5 WARNING-TAG INSTALLATION

- A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION 220553

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 220553 – IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the identification for plumbing piping and equipment is installed and is in general conformance with the Contract Documents, applicable Codes, and shop drawings. The identification for plumbing piping and equipment has been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_





## SECTION 220716 - PLUMBING EQUIPMENT 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 insulating the following plumbing equipment:
  - 1. Domestic water, hot-water and cold-water pumps.
  - 2. Domestic water storage tanks.
- B. Related Sections:
  - 1. Section 220719 "Plumbing Piping Insulation."

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory and field applied, if any).

## 1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.
- B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
  - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
  - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

## 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

## 1.6 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
- B. Coordinate clearance requirements with equipment Installer for equipment insulation application.
- C. Coordinate installation and testing of heat tracing.

## 1.7 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

# PART 2 - PRODUCTS

## 2.1 INSULATION MATERIALS

- A. Comply with requirements in "Domestic Water Boiler Breeching Insulation Schedule" and "Equipment Insulation Schedule" articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Calcium Silicate:
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Industrial Insulation Group, LLC (IIG-LLC).
  - 2. Flat-, curved-, and grooved-block sections of noncombustible, inorganic, hydrous calcium silicate with a non-asbestos fibrous reinforcement. Comply with ASTM C 533, Type I.

- G. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Pittsburgh Corning Corporation.
  2. Block Insulation: ASTM C 552, Type I.
  3. Special-Shaped Insulation: ASTM C 552, Type III.
  4. Board Insulation: ASTM C 552, Type IV.
  5. Preformed Pipe Insulation without Jacket: Comply with ASTM C 552, Type II, Class 1.
  6. Preformed Pipe Insulation with Factory-Applied ASJ: Comply with ASTM C 552, Type II, Class 2.
  7. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.
- H. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Aeroflex USA, Inc.
    - b. Armacell LLC.
    - c. K-Flex USA.
- I. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type I. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. CertainTeed Corporation.
    - b. Johns Manville; a Berkshire Hathaway company.
    - c. Knauf Insulation.
    - d. Manson Insulation Inc.
    - e. Owens Corning.
- J. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For equipment applications, provide insulation with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. CertainTeed Corporation.
    - b. Johns Manville; a Berkshire Hathaway company.
    - c. Knauf Insulation.
    - d. Manson Insulation Inc.
    - e. Owens Corning.
- K. Mineral-Fiber, Preformed Pipe Insulation:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Johns Manville; a Berkshire Hathaway company.
    - b. Knauf Insulation.
    - c. Manson Insulation Inc.
    - d. Owens Corning.
  2. Type I, 850 Deg F (454 Deg C) Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
- L. Mineral-Fiber, Pipe and Tank Insulation: Mineral or glass fibers bonded with a thermosetting resin. Semirigid board material with factory-applied ASJ complying with ASTM C 1393, Type II or Type IIIA Category 2, or with properties similar to ASTM C 612, Type IB. Nominal density is 2.5 lb/cu. ft. (40 kg/cu. m) or more. Thermal conductivity (k-value) at 100 deg F (55 deg C) is 0.29 Btu x in./h x sq. ft. x deg F (0.042 W/m x K) or less. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. CertainTeed Corporation.
    - b. Johns Manville; a Berkshire Hathaway company.
    - c. Knauf Insulation.
    - d. Manson Insulation Inc.
    - e. Owens Corning.

## 2.2 INSULATING CEMENTS

- A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Ramco Insulation, Inc.
- B. Expanded or Exfoliated Vermiculite Insulating Cement: Comply with ASTM C 196.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Ramco Insulation, Inc.
- C. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Ramco Insulation, Inc.

## 2.3 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

- B. Calcium Silicate Adhesive: Fibrous, sodium-silicate-based adhesive with a service temperature range of 50 to 800 deg F (10 to 427 deg C).
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Childers Brand; H. B. Fuller Construction Products.
    - b. Eagle Bridges - Marathon Industries.
    - c. Foster Brand; H. B. Fuller Construction Products.
    - d. Mon-Eco Industries, Inc.
    - e. Vimasco Corporation.
  2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Cellular-Glass Adhesive: Two-component, thermosetting urethane adhesive containing no flammable solvents, with a service temperature range of minus 100 to plus 200 deg F (minus 73 to plus 93 deg C).
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Foster Brand; H. B. Fuller Construction Products.
  2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- D. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Aeroflex USA, Inc.
    - b. Armacell LLC.
    - c. Foster Brand; H. B. Fuller Construction Products.
    - d. K-Flex USA.
  2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- E. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Childers Brand; H. B. Fuller Construction Products.
    - b. Eagle Bridges - Marathon Industries.

- c. Foster Brand; H. B. Fuller Construction Products.
    - d. Mon-Eco Industries, Inc.
  - 2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  - 3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- F. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Childers Brand; H. B. Fuller Construction Products.
    - b. Eagle Bridges - Marathon Industries.
    - c. Foster Brand; H. B. Fuller Construction Products.
    - d. Mon-Eco Industries, Inc.
  - 2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  - 3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- G. PVC Jacket Adhesive: Compatible with PVC jacket.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Dow Corning Corporation.
    - b. Johns Manville; a Berkshire Hathaway company.
    - c. P.I.C. Plastics, Inc.
    - d. Speedline Corporation.
  - 2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  - 3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

## 2.4 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
  - 1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below ambient services.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

- a. Foster Brand; H. B. Fuller Construction Products.
    - b. Knauf Insulation.
    - c. Vimasco Corporation.
  2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm (0.009 metric perm) at 43-mil (1.09-mm) dry film thickness.
  3. Service Temperature Range: Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C).
  4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
  5. Color: White.
- C. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below ambient services.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Childers Brand; H. B. Fuller Construction Products.
    - b. Eagle Bridges - Marathon Industries.
    - c. Foster Brand; H. B. Fuller Construction Products.
    - d. Mon-Eco Industries, Inc.
  2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm (0.03 metric perm) at 35-mil (0.9-mm) dry film thickness.
  3. Service Temperature Range: 0 to 180 deg F (Minus 18 to plus 82 deg C).
  4. Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.
  5. Color: White.
- D. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below ambient services.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Childers Brand; H. B. Fuller Construction Products.
    - b. Eagle Bridges - Marathon Industries.
    - c. Foster Brand; H. B. Fuller Construction Products.
  2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm (0.033 metric perm) at 30-mil (0.8-mm) dry film thickness.
  3. Service Temperature Range: Minus 50 to plus 220 deg F (Minus 46 to plus 104 deg C).
  4. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.
  5. Color: White.
- E. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Childers Brand; H. B. Fuller Construction Products.
    - b. Eagle Bridges - Marathon Industries.
    - c. Foster Brand; H. B. Fuller Construction Products.
    - d. Knauf Insulation.
    - e. Mon-Eco Industries, Inc.
    - f. Vimasco Corporation.

2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms (1.2 metric perms) at 0.0625-inch (1.6-mm) dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C).
4. Solids Content: 60 percent by volume and 66 percent by weight.
5. Color: White.

## 2.5 LAGGING ADHESIVES

- A. Description: Comply with MIL-A-3316C, Class I, Grade A, and shall be compatible with insulation materials, jackets, and substrates.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Childers Brand; H. B. Fuller Construction Products.
    - b. Foster Brand; H. B. Fuller Construction Products.
    - c. Vimasco Corporation.
  2. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over insulation.
  3. Service Temperature Range: 0 to plus 180 deg F (Minus 18 to plus 82 deg C).
  4. Color: White.

## 2.6 SEALANTS

- A. Joint Sealants:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Childers Brand; H. B. Fuller Construction Products.
    - b. Eagle Bridges - Marathon Industries.
    - c. Foster Brand; H. B. Fuller Construction Products.
    - d. Mon-Eco Industries, Inc.
    - e. Pittsburgh Corning Corporation.
  2. Materials shall be compatible with insulation materials, jackets, and substrates.
  3. Permanently flexible, elastomeric sealant.
  4. Service Temperature Range: Minus 100 to plus 300 deg F (Minus 73 to plus 149 deg C).
  5. Color: White or gray.
  6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  7. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- B. FSK and Metal Jacket Flashing Sealants:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Childers Brand; H. B. Fuller Construction Products.
    - b. Eagle Bridges - Marathon Industries.



- c. Foster Brand; H. B. Fuller Construction Products.
    - d. Mon-Eco Industries, Inc.
  - 2. Materials shall be compatible with insulation materials, jackets, and substrates.
  - 3. Fire- and water-resistant, flexible, elastomeric sealant.
  - 4. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
  - 5. Color: Aluminum.
  - 6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  - 7. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:
- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Childers Brand; H. B. Fuller Construction Products.
  - 2. Materials shall be compatible with insulation materials, jackets, and substrates.
  - 3. Fire- and water-resistant, flexible, elastomeric sealant.
  - 4. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
  - 5. Color: White.
  - 6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  - 7. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

## 2.7 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
- 1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
  - 2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
  - 3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
  - 4. PVDC Jacket for Indoor Applications: 4-mil- (0.10-mm-) thick, white PVDC biaxially oriented barrier film with a permeance at 0.02 perm (0.013 metric perm) when tested according to ASTM E 96/E 96M and with a flame-spread index of 5 and a smoke-developed index of 20 when tested according to ASTM E 84.
    - 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) Dow Chemical Company (The).

5. PVDC Jacket for Outdoor Applications: 6-mil- (0.15-mm-) thick, white PVDC biaxially oriented barrier film with a permeance at 0.01 perm (0.007 metric perm) when tested according to ASTM E 96/E 96M and with a flame-spread index of 5 and a smoke-developed index of 25 when tested according to ASTM E 84.
  - 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) Dow Chemical Company (The).

## 2.8 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
  1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Avery Dennison Corporation, Specialty Tapes Division.
    - b. Compac Corporation.
    - c. Ideal Tape Co., Inc., an American Biltrite Company.
    - d. Knauf Insulation.
    - e. Venture Tape.
  2. Width: 3 inches (75 mm).
  3. Thickness: 11.5 mils (0.29 mm).
  4. Adhesion: 90 ounces force/inch (1.0 N/mm) in width.
  5. Elongation: 2 percent.
  6. Tensile Strength: 40 lbf/inch (7.2 N/mm) in width.
  7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.
- B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
  1. Manufacturers: 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. Avery Dennison Corporation, Specialty Tapes Division.
    - b. Compac Corporation.
    - c. Ideal Tape Co., Inc., an American Biltrite Company.
    - d. Knauf Insulation.
    - e. Venture Tape.
  2. Width: 3 inches (75 mm).
  3. Thickness: 6.5 mils (0.16 mm).
  4. Adhesion: 90 ounces force/inch (1.0 N/mm) in width.
  5. Elongation: 2 percent.
  6. Tensile Strength: 40 lbf/inch (7.2 N/mm) in width.
  7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.
- C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.
  1. Manufacturers: 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. Compac Corporation.
    - b. Ideal Tape Co., Inc., an American Biltrite Company.
    - c. Venture Tape.
  2. Width: 2 inches (50 mm).
  3. Thickness: 6 mils (0.15 mm).
  4. Adhesion: 64 ounces force/inch (0.7 N/mm) in width.
  5. Elongation: 500 percent.
  6. Tensile Strength: 18 lbf/inch (3.3 N/mm) in width.
- D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Avery Dennison Corporation, Specialty Tapes Division.
    - b. Compac Corporation.
    - c. Ideal Tape Co., Inc., an American Biltrite Company.
    - d. Knauf Insulation.
    - e. Venture Tape.
  2. Width: 2 inches (50 mm).
  3. Thickness: 3.7 mils (0.093 mm).
  4. Adhesion: 100 ounces force/inch (1.1 N/mm) in width.
  5. Elongation: 5 percent.
  6. Tensile Strength: 34 lbf/inch (6.2 N/mm) in width.

## 2.9 SECUREMENTS

- A. Bands:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. ITW Insulation Systems; Illinois Tool Works, Inc.
    - b. RPR Products, Inc.
  2. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316; 0.015 inch (0.38 mm) thick, 1/2 inch (13 mm) wide with wing seal or closed seal.
  3. Aluminum: ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch (0.51 mm) thick, 3/4 inch (19 mm) wide with wing seal or closed seal.
  4. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.
- B. Insulation Pins and Hangers:
1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated.
    - 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) AGM Industries, Inc.
      - 2) Gemco.
      - 3) Midwest Fasteners, Inc.
      - 4) Nelson Stud Welding.

2. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch (38-mm) galvanized carbon-steel washer.
  - 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) AGM Industries, Inc.
    - 2) CL WARD & Family Inc.
    - 3) Gemco.
    - 4) Midwest Fasteners, Inc.
    - 5) Nelson Stud Welding.
3. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place.
  - 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) AGM Industries, Inc.
    - 2) Gemco.
    - 3) Midwest Fasteners, Inc.
  - b. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch (0.76 mm) thick by 2 inches (50 mm) square.
  - c. Spindle: Copper- or zinc-coated, low-carbon steel, fully annealed, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated.
  - d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.
4. Nonmetal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate fastened to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place.
  - 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) Gemco.
    - 2) Midwest Fasteners, Inc.
  - b. Baseplate: Perforated, nylon sheet, 0.030 inch (0.76 mm) thick by 1-1/2 inches (38 mm) in diameter.
  - c. Spindle: Nylon, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated, up to 2-1/2 inches (63 mm).
  - d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.
5. Self-Sticking-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place.
  - 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) AGM Industries, Inc.
      - 2) Gemco.
      - 3) Midwest Fasteners, Inc.
    - b. Baseplate: Galvanized carbon-steel sheet, 0.030 inch (0.76 mm) thick by 2 inches (50 mm) square.
    - c. Spindle: Copper- or zinc-coated, low-carbon steel, fully annealed, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated.
    - d. Adhesive-backed base with a peel-off protective cover.
  6. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- (0.41-mm-) thick, galvanized-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches (38 mm) in diameter.
    - 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) AGM Industries, Inc.
      - 2) Gemco.
      - 3) Midwest Fasteners, Inc.
      - 4) Nelson Stud Welding.
    - b. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.
  7. Nonmetal Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- (0.41-mm-) thick nylon sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches (38 mm) in diameter.
    - 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) Gemco.
      - 2) Midwest Fasteners, Inc.
- C. Staples: Outward-clinching insulation staples, nominal 3/4-inch- (19-mm-) wide, stainless steel or Monel.
- D. Wire: 0.080-inch (2.0-mm) nickel-copper alloy.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. C & F Wire.

## 2.10 CORNER ANGLES

- A. PVC Corner Angles: 30 mils (0.8 mm) thick, minimum 1 by 1 inch (25 by 25 mm), PVC according to ASTM D 1784, Class 16354-C. White or color-coded to match adjacent surface.
- B. Aluminum Corner Angles: 0.040 inch (1.0 mm) thick, minimum 1 by 1 inch (25 by 25 mm), aluminum according to ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005; Temper H-14.

- C. Stainless-Steel Corner Angles: 0.024 inch (0.61 mm) thick, minimum 1 by 1 inch (25 by 25 mm), stainless steel according to ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
  - 1. Verify that systems and equipment to be insulated have been tested and are free of defects.
  - 2. Verify that surfaces to be insulated are clean and dry.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:
  - 1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils (0.127 mm) thick and an epoxy finish 5 mils (0.127 mm) thick if operating in a temperature range between 140 and 300 deg F (60 and 149 deg C). Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
  - 2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F (0 and 149 deg C) with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
- C. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

### 3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item as specified in insulation system schedules.

- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Keep insulation materials dry during application and finishing.
- G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- H. Install insulation with least number of joints practical.
- I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
  - 1. Install insulation continuously through hangers and around anchor attachments.
  - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
  - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
  - 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- K. Install insulation with factory-applied jackets as follows:
  - 1. Draw jacket tight and smooth.
  - 2. Cover circumferential joints with 3-inch- (75-mm-) wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches (100 mm) o.c.
  - 3. Overlap jacket longitudinal seams at least 1-1/2 inches (38 mm). Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches (50 mm) o.c.
    - a. For below ambient services, apply vapor-barrier mastic over staples.
  - 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
  - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints.
- L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

- M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches (100 mm) beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- O. For above ambient services, do not install insulation to the following:
  - 1. Vibration-control devices.
  - 2. Testing agency labels and stamps.
  - 3. Nameplates and data plates.
  - 4. Manholes.
  - 5. Handholes.
  - 6. Cleanouts.

### 3.4 INSTALLATION OF EQUIPMENT, TANK, AND VESSEL INSULATION

- A. Mineral-Fiber, Pipe, and Tank Insulation Installation for Tanks and Vessels: Secure insulation with adhesive and anchor pins and speed washers.
  - 1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of tank and vessel surfaces.
  - 2. Groove and score insulation materials to fit as closely as possible to equipment, including contours. Bevel insulation edges for cylindrical surfaces for tight joints. Stagger end joints.
  - 3. Protect exposed corners with secured corner angles.
  - 4. Install adhesively attached or self-sticking insulation hangers and speed washers on sides of tanks and vessels as follows:
    - a. Do not weld anchor pins to ASME-labeled pressure vessels.
    - b. Select insulation hangers and adhesive that are compatible with service temperature and with substrate.
    - c. On tanks and vessels, maximum anchor-pin spacing is 3 inches (75 mm) from insulation end joints, and 16 inches (400 mm) o.c. in both directions.
    - d. Do not overcompress insulation during installation.
    - e. Cut and miter insulation segments to fit curved sides and domed heads of tanks and vessels.
    - f. Impale insulation over anchor pins and attach speed washers.
    - g. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
  - 5. Secure each layer of insulation with stainless-steel or aluminum bands. Select band material compatible with insulation materials.
  - 6. Where insulation hangers on equipment and vessels are not permitted or practical and where insulation support rings are not provided, install a girdle network for securing insulation. Stretch prestressed aircraft cable around the diameter of vessel and make taut with clamps, turnbuckles, or breather springs. Place one circumferential girdle around equipment approximately 6 inches (150 mm) from each end. Install wire or cable between two circumferential girdles 12 inches (300 mm) o.c. Install a wire ring around each end and around outer periphery of center openings, and stretch prestressed aircraft cable radially from the wire ring to nearest circumferential girdle. Install additional circumferential



- girdles along the body of equipment or tank at a minimum spacing of 48 inches (1200 mm) o.c. Use this network for securing insulation with tie wire or bands.
7. Stagger joints between insulation layers at least 3 inches (75 mm).
  8. Install insulation in removable segments on equipment access doors, manholes, handholes, and other elements that require frequent removal for service and inspection.
  9. Bevel and seal insulation ends around manholes, handholes, ASME stamps, and nameplates.
  10. For equipment with surface temperatures below ambient, apply mastic to open ends, joints, seams, breaks, and punctures in insulation.

- B. Flexible Elastomeric Thermal Insulation Installation for Tanks and Vessels: Install insulation over entire surface of tanks and vessels.
1. Apply 100 percent coverage of adhesive to surface with manufacturer's recommended adhesive.
  2. Seal longitudinal seams and end joints.

### 3.5 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

- A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

### 3.6 FINISHES

- A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 099000 "Painting and Coating".
1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
    - a. Finish Coat Material: Interior, flat, latex-emulsion size.
- B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.
- C. Color: Final color as selected by BSRO & Architect. Vary first and second coats to allow visual inspection of the completed Work.
- D. Do not field paint aluminum or stainless-steel jackets.

### 3.7 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
1. Inspect field-insulated equipment, randomly selected by BSRO, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each type of equipment

defined in the "Equipment Insulation Schedule" Article. For large equipment, remove only a portion adequate to determine compliance.

- C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

### 3.8 EQUIPMENT INSULATION SCHEDULE

- A. Insulation materials and thicknesses are identified below. If more than one material is listed for a type of equipment, selection from materials listed is Contractor's option.
- B. Insulate indoor and outdoor equipment that is not factory insulated.
- C. Domestic water pump insulation shall be one of the following:
  - 1. Cellular Glass: 2 inches (50 mm) thick.
  - 2. Mineral-Fiber Blanket: 1 inch (25 mm) thick and 2-lb/cu. ft. (32-kg/cu. m) nominal density.
  - 3. Mineral-Fiber Board: 1 inch (25 mm) thick and 2-lb/cu. ft. (32-kg/cu. m) nominal density.
- D. Domestic hot-water pump insulation shall be one of the following:
  - 1. Cellular Glass: 2 inches (50 mm) thick.
  - 2. Mineral-Fiber Blanket: 1 inch (25 mm) thick and 2-lb/cu. ft. (32-kg/cu. m) nominal density.
  - 3. Mineral-Fiber Board: 1 inch (25 mm) thick and 2-lb/cu. ft. (32-kg/cu. m) nominal density.
- E. Domestic hot-water storage tank insulation shall be one of the following, of thickness to provide an R-value of 12.5:
  - 1. Cellular glass.
  - 2. Mineral-Fiber Blanket: 2-lb/cu. ft. (32-kg/cu. m) nominal density.
  - 3. Mineral-Fiber Board: 2-lb/cu. ft. (32-kg/cu. m) nominal density.
  - 4. Mineral-fiber pipe and tank.

END OF SECTION 220716

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 220716 – PLUMBING EQUIPMENT INSULATION

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the plumbing equipment is installed and is in general conformance with the Contract Documents, applicable Codes, and shop drawings. The plumbing equipment insulation has been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

PLUMBING EQUIPMENT INSULATION INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_



## SECTION 220719 - PLUMBING PIPING 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 insulating the following plumbing piping services:
  - 1. Domestic cold-water piping.
  - 2. Domestic hot-water piping.
  - 3. Domestic recirculating hot-water piping.
  - 4. Roof drains and rainwater leaders.
  - 5. Supplies and drains for handicap-accessible lavatories and sinks.
- B. Related Sections:
  - 1. Section 220716 "Plumbing Equipment Insulation."

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied, if any).
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
  - 1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
  - 2. Detail attachment and covering of heat tracing inside insulation.
  - 3. Detail insulation application at pipe expansion joints for each type of insulation.
  - 4. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
  - 5. Detail removable insulation at piping specialties, equipment connections, and access panels.
  - 6. Detail application of field-applied jackets.
  - 7. Detail application at linkages of control devices.

## 1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.
- C. Field quality-control reports.

### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.
- B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
  - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
  - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.
- C. Comply with the following applicable standards and other requirements specified for miscellaneous components:
  - 1. Supply and Drain Protective Shielding Guards: ICC A117.1.

### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

### 1.7 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
- B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.
- C. Coordinate installation and testing of heat tracing.

### 1.8 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

## PART 2 - PRODUCTS

## 2.1 INSULATION MATERIALS

- A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. Pittsburgh Corning Corporation.
  - 2. Block Insulation: ASTM C 552, Type I.
  - 3. Special-Shaped Insulation: ASTM C 552, Type III.
  - 4. Preformed Pipe Insulation without Jacket: Comply with ASTM C 552, Type II, Class 1.
  - 5. Preformed Pipe Insulation with Factory-Applied [ASJ] [ASJ-SSL]: Comply with ASTM C 552, Type II, Class 2.
  - 6. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.
- G. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Aeroflex USA, Inc.
    - b. Armacell LLC.
    - c. K-Flex USA.
- H. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type I. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. CertainTeed Corporation.
    - b. Johns Manville; a Berkshire Hathaway company.
    - c. Knauf Insulation.
    - d. Manson Insulation Inc.
    - e. Owens Corning.
- I. Mineral-Fiber, Preformed Pipe Insulation:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Johns Manville; a Berkshire Hathaway company.
    - b. Knauf Insulation.
    - c. Manson Insulation Inc.
    - d. Owens Corning.
  2. Type I, 850 Deg F (454 Deg C) Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
- J. Phenolic:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Kingspan Tarec Industrial Insulation NV.
    - b. Resolco International BV.
  2. Preformed pipe insulation of rigid, expanded, closed-cell structure. Comply with ASTM C 1126, Type III, Grade 1.
  3. Block insulation of rigid, expanded, closed-cell structure. Comply with ASTM C 1126, Type II, Grade 1.
  4. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.
  5. Factory-Applied Jacket: ASJ. Requirements are specified in "Factory-Applied Jackets" Article.
- K. Polyolefin: Unicellular, polyethylene thermal plastic insulation. Comply with ASTM C 534 or ASTM C 1427, Type I, Grade 1 for tubular materials.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Armacell LLC.
    - b. Nomaco Insulation.

## 2.2 INSULATING CEMENTS

- A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. Ramco Insulation, Inc.
- B. Expanded or Exfoliated Vermiculite Insulating Cement: Comply with ASTM C 196.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Ramco Insulation, Inc.
- C. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Ramco Insulation, Inc.

## 2.3 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.



- B. Cellular-Glass Adhesive: Two-component, thermosetting urethane adhesive containing no flammable solvents, with a service temperature range of minus 100 to plus 200 deg F (minus 73 to plus 93 deg C).
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Foster Brand; H. B. Fuller Construction Products.
  2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Aeroflex USA, Inc.
    - b. Armacell LLC.
    - c. Foster Brand; H. B. Fuller Construction Products.
    - d. K-Flex USA.
  2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- D. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Childers Brand; H. B. Fuller Construction Products.
    - b. Eagle Bridges - Marathon Industries.
    - c. Foster Brand; H. B. Fuller Construction Products.
    - d. Mon-Eco Industries, Inc.
  2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- E. Phenolic Adhesive: Solvent-based resin adhesive, with a service temperature range of minus 75 to plus 300 deg F (minus 59 to plus 149 deg C).
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Childers Brand; H. B. Fuller Construction Products.
    - b. Foster Brand; H. B. Fuller Construction Products.
  2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- F. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Childers Brand; H. B. Fuller Construction Products.
    - b. Eagle Bridges - Marathon Industries.
    - c. Foster Brand; H. B. Fuller Construction Products.
    - d. Mon-Eco Industries, Inc.
  2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- G. PVC Jacket Adhesive: Compatible with PVC jacket.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Dow Corning Corporation.
    - b. Johns Manville; a Berkshire Hathaway company.
    - c. P.I.C. Plastics, Inc.
    - d. Speedline Corporation.
  2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

## 2.4 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Foster Brand; H. B. Fuller Construction Products.
    - b. Knauf Insulation.
    - c. Vimasco Corporation.
  2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm (0.009 metric perm) at 43-mil (1.09-mm) dry film thickness.
  3. Service Temperature Range: Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C).
  4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
  5. Color: White.
- C. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below-ambient services.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Childers Brand; H. B. Fuller Construction Products.
    - b. Eagle Bridges - Marathon Industries.
    - c. Foster Brand; H. B. Fuller Construction Products.
    - d. Mon-Eco Industries, Inc.
  2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm (0.03 metric perm) at 35-mil (0.9-mm) dry film thickness.
  3. Service Temperature Range: 0 to 180 deg F (Minus 18 to plus 82 deg C).

4. Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.
  5. Color: White.
- D. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below-ambient services.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Childers Brand; H. B. Fuller Construction Products.
    - b. Eagle Bridges - Marathon Industries.
    - c. Foster Brand; H. B. Fuller Construction Products.
  2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm (0.033 metric perm) at 30-mil (0.8-mm) dry film thickness.
  3. Service Temperature Range: Minus 50 to plus 220 deg F (Minus 46 to plus 104 deg C).
  4. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.
  5. Color: White.
- E. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Childers Brand; H. B. Fuller Construction Products.
    - b. Eagle Bridges - Marathon Industries.
    - c. Foster Brand; H. B. Fuller Construction Products.
    - d. Knauf Insulation.
    - e. Mon-Eco Industries, Inc.
    - f. Vimasco Corporation.
  2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms (1.2 metric perms) at 0.0625-inch (1.6-mm) dry film thickness.
  3. Service Temperature Range: Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C).
  4. Solids Content: 60 percent by volume and 66 percent by weight.
  5. Color: White.

## 2.5 LAGGING ADHESIVES

- A. Description: Comply with MIL-A-3316C, Class I, Grade A, and shall be compatible with insulation materials, jackets, and substrates.
1. For indoor applications, use lagging adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Childers Brand; H. B. Fuller Construction Products.
    - b. Foster Brand; H. B. Fuller Construction Products.
    - c. Vimasco Corporation.
  3. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over pipe insulation.
  4. Service Temperature Range: 0 to plus 180 deg F (Minus 18 to plus 82 deg C).
  5. Color: White.

## 2.6 SEALANTS

- A. Joint Sealants:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Childers Brand; H. B. Fuller Construction Products.
    - b. Eagle Bridges - Marathon Industries.
    - c. Foster Brand; H. B. Fuller Construction Products.

- d. Mon-Eco Industries, Inc.
    - e. Pittsburgh Corning Corporation.
  - 2. Materials shall be compatible with insulation materials, jackets, and substrates.
  - 3. Permanently flexible, elastomeric sealant.
  - 4. Service Temperature Range: Minus 100 to plus 300 deg F (Minus 73 to plus 149 deg C).
  - 5. Color: White or gray.
  - 6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  - 7. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- B. FSK and Metal Jacket Flashing Sealants:
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Childers Brand; H. B. Fuller Construction Products.
    - b. Eagle Bridges - Marathon Industries.
    - c. Foster Brand; H. B. Fuller Construction Products.
    - d. Mon-Eco Industries, Inc.
  - 2. Materials shall be compatible with insulation materials, jackets, and substrates.
  - 3. Fire- and water-resistant, flexible, elastomeric sealant.
  - 4. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
  - 5. Color: Aluminum.
  - 6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  - 7. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:
- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Childers Brand; H. B. Fuller Construction Products.
  - 2. Materials shall be compatible with insulation materials, jackets, and substrates.
  - 3. Fire- and water-resistant, flexible, elastomeric sealant.
  - 4. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
  - 5. Color: White.
  - 6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  - 7. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

## 2.7 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
- 1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
  - 2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
  - 3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

## 2.8 FIELD-APPLIED FABRIC-REINFORCING MESH

- A. Woven Glass-Fiber Fabric: Approximately 2 oz./sq. yd. (68 g/sq. m) with a thread count of 10 strands by 10 strands/sq. in. (4 strands by 4 strands/sq. mm) for covering pipe and pipe fittings.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Childers Brand; H. B. Fuller Construction Products.
- B. Woven Polyester Fabric: Approximately 1 oz./sq. yd. (34 g/sq. m) with a thread count of 10 strands by 10 strands/sq. in. (4 strands by 4 strands/sq. mm), in a Leno weave, for pipe.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Foster Brand; H. B. Fuller Construction Products.
    - b. Vimasco Corporation.

## 2.9 FIELD-APPLIED CLOTHS

- A. Woven Glass-Fiber Fabric: Comply with MIL-C-20079H, Type I, plain weave, and presized a minimum of 8 oz./sq. yd. (271 g/sq. m).
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Alpha Associates, Inc.

## 2.10 FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
- B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Johns Manville; a Berkshire Hathaway company.
    - b. P.I.C. Plastics, Inc.
    - c. Proto Corporation.
    - d. Speedline Corporation.
  - 2. Adhesive: As recommended by jacket material manufacturer.
  - 3. Color: White.
  - 4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.
    - a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.
- C. Metal Jacket:
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

- a. Childers Brand; H. B. Fuller Construction Products.
- b. ITW Insulation Systems; Illinois Tool Works, Inc.
- c. RPR Products, Inc.
2. Aluminum Jacket: Comply with ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005, Temper H-14.
  - a. Factory cut and rolled to size.
  - b. Finish and thickness are indicated in field-applied jacket schedules.
  - c. Moisture Barrier for Indoor Applications: 1-mil- (0.025-mm-) thick, heat-bonded polyethylene and kraft paper.
  - d. Moisture Barrier for Outdoor Applications: 3-mil- (0.075-mm-) thick, heat-bonded polyethylene and kraft paper.
  - e. Factory-Fabricated Fitting Covers:
    - 1) Same material, finish, and thickness as jacket.
    - 2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
    - 3) Tee covers.
    - 4) Flange and union covers.
    - 5) End caps.
    - 6) Beveled collars.
    - 7) Valve covers.
    - 8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

## 2.11 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Avery Dennison Corporation, Specialty Tapes Division.
    - b. Compac Corporation.
    - c. Ideal Tape Co., Inc., an American Biltrite Company.
    - d. Knauf Insulation.
    - e. Venture Tape.
  2. Width: 3 inches (75 mm).
  3. Thickness: 11.5 mils (0.29 mm).
  4. Adhesion: 90 ounces force/inch (1.0 N/mm) in width.
  5. Elongation: 2 percent.
  6. Tensile Strength: 40 lbf/inch (7.2 N/mm) in width.
  7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.
- B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Avery Dennison Corporation, Specialty Tapes Division.
    - b. Compac Corporation.
    - c. Ideal Tape Co., Inc., an American Biltrite Company.
    - d. Knauf Insulation.
    - e. Venture Tape.
  2. Width: 3 inches (75 mm).
  3. Thickness: 6.5 mils (0.16 mm).
  4. Adhesion: 90 ounces force/inch (1.0 N/mm) in width.
  5. Elongation: 2 percent.

6. Tensile Strength: 40 lbf/inch (7.2 N/mm) in width.
  7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.
- C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.
1. Manufacturers: 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. Compac Corporation.
    - b. Ideal Tape Co., Inc., an American Biltrite Company.
    - c. Venture Tape.
  2. Width: 2 inches (50 mm).
  3. Thickness: 6 mils (0.15 mm).
  4. Adhesion: 64 ounces force/inch (0.7 N/mm) in width.
  5. Elongation: 500 percent.
  6. Tensile Strength: 18 lbf/inch (3.3 N/mm) in width.
- D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Avery Dennison Corporation, Specialty Tapes Division.
    - b. Compac Corporation.
    - c. Ideal Tape Co., Inc., an American Biltrite Company.
    - d. Knauf Insulation.
    - e. Venture Tape.
  2. Width: 2 inches (50 mm).
  3. Thickness: 3.7 mils (0.093 mm).
  4. Adhesion: 100 ounces force/inch (1.1 N/mm) in width.
  5. Elongation: 5 percent.
  6. Tensile Strength: 34 lbf/inch (6.2 N/mm) in width.

## 2.12 SECUREMENTS

- A. Bands:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. ITW Insulation Systems; Illinois Tool Works, Inc.
    - b. RPR Products, Inc.
  2. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316; 0.015 inch (0.38 mm) thick, 1/2 inch (13 mm) wide with wing seal or closed seal.
  3. Aluminum: ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch (0.51 mm) thick, 3/4 inch (19 mm) wide with wing seal or closed seal.
- B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- (19-mm-) wide, stainless steel or Monel.
- C. Wire: 0.080-inch (2.0-mm) nickel-copper alloy.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. C & F Wire.

## 2.13 PROTECTIVE SHIELDING GUARDS

- A. Protective Shielding Pipe Covers,:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Insul-Tect Products Co.
    - b. McGuire Manufacturing.
    - c. Plumberex Specialty Products, Inc.
    - d. Truebro.
    - e. Zurn Industries, LLC.
  - 2. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.
- B. Protective Shielding Piping Enclosures,:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Truebro.
    - b. Zurn Industries, LLC.
  - 2. Description: Manufactured plastic enclosure for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with ADA requirements.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
  - 1. Verify that systems to be insulated have been tested and are free of defects.
  - 2. Verify that surfaces to be insulated are clean and dry.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:
  - 1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils (0.127 mm) thick and an epoxy finish 5 mils (0.127 mm) thick if operating in a temperature range between 140 and 300 deg F (60 and 149 deg C). Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
  - 2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F (0 and 149 deg C) with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
- C. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.



- D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

### 3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
  - 1. Install insulation continuously through hangers and around anchor attachments.
  - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
  - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
  - 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Install insulation with factory-applied jackets as follows:
  - 1. Draw jacket tight and smooth.
  - 2. Cover circumferential joints with 3-inch- (75-mm-) wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches (100 mm) o.c.
  - 3. Overlap jacket longitudinal seams at least 1-1/2 inches (38 mm). Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches (50 mm) o.c.
    - a. For below-ambient services, apply vapor-barrier mastic over staples.
  - 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.

5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
- M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches (100 mm) beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- P. For above-ambient services, do not install insulation to the following:
  1. Vibration-control devices.
  2. Testing agency labels and stamps.
  3. Nameplates and data plates.
  4. Cleanouts.

### 3.4 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
  1. Seal penetrations with flashing sealant.
  2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
  3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches (50 mm) below top of roof flashing.
  4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.
- C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
  1. Seal penetrations with flashing sealant.
  2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
  3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches (50 mm).
  4. Seal jacket to wall flashing with flashing sealant.
- D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
  1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

- F. Insulation Installation at Floor Penetrations:
  - 1. Pipe: Install insulation continuously through floor penetrations.
  - 2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

### 3.5 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
  - 1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
  - 2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
  - 3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
  - 4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
  - 5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
  - 6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
  - 7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
  - 8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
  - 9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

- D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
  2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
  3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
  4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches (50 mm) over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
  5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

### 3.6 INSTALLATION OF CELLULAR-GLASS INSULATION

- A. Insulation Installation on Straight Pipes and Tubes:
1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
  2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
  3. For insulation with factory-applied jackets on above-ambient services, secure laps with outward clinched staples at 6 inches (150 mm) o.c.
  4. For insulation with factory-applied jackets on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.
- B. Insulation Installation on Pipe Flanges:
1. Install preformed pipe insulation to outer diameter of pipe flange.
  2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
  3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of same thickness as pipe insulation.
  4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch (25 mm), and seal joints with flashing sealant.
- C. Insulation Installation on Pipe Fittings and Elbows:
1. Install preformed sections of same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
  2. When preformed sections of insulation are not available, install mitered sections of cellular-glass insulation. Secure insulation materials with wire or bands.
- D. Insulation Installation on Valves and Pipe Specialties:
1. Install preformed sections of cellular-glass insulation to valve body.
  2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
  3. Install insulation to flanges as specified for flange insulation application.

### 3.7 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

- A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- B. Insulation Installation on Pipe Flanges:
  - 1. Install pipe insulation to outer diameter of pipe flange.
  - 2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
  - 3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
  - 4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- C. Insulation Installation on Pipe Fittings and Elbows:
  - 1. Install mitered sections of pipe insulation.
  - 2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- D. Insulation Installation on Valves and Pipe Specialties:
  - 1. Install preformed valve covers manufactured of same material as pipe insulation when available.
  - 2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
  - 3. Install insulation to flanges as specified for flange insulation application.
  - 4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

### 3.8 INSTALLATION OF MINERAL-FIBER INSULATION

- A. Insulation Installation on Straight Pipes and Tubes:
  - 1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
  - 2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
  - 3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward clinched staples at 6 inches (150 mm) o.c.
  - 4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.
- B. Insulation Installation on Pipe Flanges:
  - 1. Install preformed pipe insulation to outer diameter of pipe flange.
  - 2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
  - 3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
  - 4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch (25 mm), and seal joints with flashing sealant.

- C. Insulation Installation on Pipe Fittings and Elbows:
  - 1. Install preformed sections of same material as straight segments of pipe insulation when available.
  - 2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.
- D. Insulation Installation on Valves and Pipe Specialties:
  - 1. Install preformed sections of same material as straight segments of pipe insulation when available.
  - 2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
  - 3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
  - 4. Install insulation to flanges as specified for flange insulation application.

### 3.9 INSTALLATION OF PHENOLIC INSULATION

- A. General Installation Requirements:
  - 1. Secure single-layer insulation with stainless-steel bands at 12-inch (300-mm) intervals and tighten bands without deforming insulation materials.
  - 2. Install 2-layer insulation with joints tightly butted and staggered at least 3 inches (75 mm). Secure inner layer with 0.062-inch (1.6-mm) wire spaced at 12-inch (300-mm) intervals. Secure outer layer with stainless-steel bands at 12-inch (300-mm) intervals.
- B. Insulation Installation on Straight Pipes and Tubes:
  - 1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
  - 2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
  - 3. For insulation with factory-applied jackets on above-ambient services, secure laps with outward clinched staples at 6 inches (150 mm) o.c.
  - 4. For insulation with factory-applied jackets with vapor retarders on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.
- C. Insulation Installation on Pipe Flanges:
  - 1. Install preformed pipe insulation to outer diameter of pipe flange.
  - 2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
  - 3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of block insulation of same material and thickness as pipe insulation.
- D. Insulation Installation on Pipe Fittings and Elbows:
  - 1. Install preformed insulation sections of same material as straight segments of pipe insulation. Secure according to manufacturer's written instructions.
- E. Insulation Installation on Valves and Pipe Specialties:
  - 1. Install preformed insulation sections of same material as straight segments of pipe insulation. Secure according to manufacturer's written instructions.

2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.

### 3.10 FIELD-APPLIED JACKET INSTALLATION

- A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.
  1. Draw jacket smooth and tight to surface with 2-inch (50-mm) overlap at seams and joints.
  2. Embed glass cloth between two 0.062-inch- (1.6-mm-) thick coats of lagging adhesive.
  3. Completely encapsulate insulation with coating, leaving no exposed insulation.
- B. Where FSK jackets are indicated, install as follows:
  1. Draw jacket material smooth and tight.
  2. Install lap or joint strips with same material as jacket.
  3. Secure jacket to insulation with manufacturer's recommended adhesive.
  4. Install jacket with 1-1/2-inch (38-mm) laps at longitudinal seams and 3-inch- (75-mm-) wide joint strips at end joints.
  5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.
- C. Where PVC jackets are indicated, install with 1-inch (25-mm) overlap at longitudinal seams and end joints. Seal with manufacturer's recommended adhesive.
  1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.
- D. Where metal jackets are indicated, install with 2-inch (50-mm) overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches (300 mm) o.c. and at end joints.

### 3.11 FINISHES

- A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 099000 "Painting and Coating."
  1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
    - a. Finish Coat Material: Interior, flat, latex-emulsion size.
- B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.
- C. Color: Final color as selected by BSRO & Architect. Vary first and second coats to allow visual inspection of the completed Work.
- D. Do not field paint aluminum or stainless-steel jackets.

### 3.12 FIELD QUALITY CONTROL

- A. Perform tests and inspections.

- B. Tests and Inspections:
  - 1. Inspect pipe, fittings, strainers, and valves, randomly selected by BSRO, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.
- C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

### 3.13 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.
- B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
  - 1. Drainage piping located in crawl spaces.
  - 2. Underground piping.
  - 3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

### 3.14 INDOOR PIPING INSULATION SCHEDULE

- A. Domestic Cold Water:
  - 1. Insulation shall be one of the following:
    - a. Cellular Glass: 1-1/2 inches (38 mm) thick.
    - b. Flexible Elastomeric: 1 inch (25 mm) thick.
    - c. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch (25 mm) thick.
    - d. Phenolic: 1 inch (25 mm) thick.
- B. Domestic Hot and Recirculated Hot Water:
  - 1. Insulation shall be one of the following:
    - a. Cellular Glass: 1-1/2 inches (38 mm) thick.
    - b. Flexible Elastomeric: 1 inch (25 mm) thick.
    - c. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch (25 mm) thick.
    - d. Phenolic: 1 inch (25 mm) thick.
- C. Stormwater and Overflow:
  - 1. All Pipe Sizes: Insulation shall be one of the following:
    - a. Cellular Glass: 1-1/2 inches (38 mm) thick.
    - b. Flexible Elastomeric: 1 inch (25 mm) thick.
    - c. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch (25 mm) thick.
    - d. Phenolic: 1 inch (25 mm) thick.
- D. Roof Drain and Overflow Drain Bodies:
  - 1. All Pipe Sizes: Insulation shall be one of the following:
    - a. Cellular Glass: 1-1/2 inches (38 mm) thick.
    - b. Flexible Elastomeric: 1 inch (25 mm) thick.
    - c. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch (25 mm) thick.
    - d. Phenolic: 1 inch (25 mm) thick.



- E. Exposed Sanitary Drains, Domestic Water, Domestic Hot Water, and Stops for Plumbing Fixtures for People with Disabilities:
  - 1. All Pipe Sizes: Insulation shall be one of the following:
    - a. Flexible Elastomeric: 1/2 inch (13 mm) thick.
    - b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch (13 mm) thick.

END OF SECTION 220719

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 220719 – PLUMBING PIPING INSULATION

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the plumbing piping insulation is installed and is in general conformance with the Contract Documents, applicable Codes, and shop drawings. The plumbing piping insulation has been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

PLUMBING PIPING INSULATION INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_

## SECTION 221113 - FACILITY WATER DISTRIBUTION PIPING

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes water-distribution piping and related components outside the building for water service.
- B. Utility-furnished products include water meters that will be furnished to the site, ready for installation.

## 1.3 DEFINITIONS

- A. EPDM: Ethylene propylene diene terpolymer rubber.
- B. LLDPE: Linear, low-density polyethylene plastic.
- C. PA: Polyamide (nylon) plastic.
- D. PE: Polyethylene plastic.
- E. PP: Polypropylene plastic.
- F. PVC: Polyvinyl chloride plastic.
- G. RTRF: Reinforced thermosetting resin (fiberglass) fittings.
- H. RTRP: Reinforced thermosetting resin (fiberglass) pipe.

## 1.4 ACTION SUBMITTALS

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

## 1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: For piping and specialties including relation to other services in same area, drawn to scale. Show piping and specialty sizes and valves, meter and specialty locations, and elevations.
- B. Field quality-control test reports.

## 1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For water valves and specialties to include in emergency, operation, and maintenance manuals.

## 1.7 QUALITY ASSURANCE

- A. Regulatory Requirements:
  - 1. Comply with requirements of utility company supplying water. Include tapping of water mains and backflow prevention.
  - 2. Comply with standards of authorities having jurisdiction for potable-water-service piping, including materials, installation, testing, and disinfection.
  - 3. Comply with standards of authorities having jurisdiction for fire-suppression water-service piping, including materials, hose threads, installation, and testing.
- B. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- D. Comply with ASTM F 645 for selection, design, and installation of thermoplastic water piping.
- E. Comply with FMG's "Approval Guide" or UL's "Fire Protection Equipment Directory" for fire-service-main products.
- F. NFPA Compliance: Comply with NFPA 24 for materials, installations, tests, flushing, and valve and hydrant supervision for fire-service-main piping for fire suppression.
- G. NSF Compliance:
  - 1. Comply with NSF 14 for plastic potable-water-service piping.
  - 2. Comply with NSF 61 Annex G for materials for water-service piping and specialties for domestic water.

## 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Preparation for Transport: Prepare valves, including fire hydrants, according to the following:
  - 1. Ensure that valves are dry and internally protected against rust and corrosion.
  - 2. Protect valves against damage to threaded ends and flange faces.
  - 3. Set valves in best position for handling. Set valves closed to prevent rattling.
- B. During Storage: Use precautions for valves, including fire hydrants, according to the following:
  - 1. Do not remove end protectors unless necessary for inspection; then reinstall for storage.
  - 2. Protect from weather. Store indoors and maintain temperature higher than ambient dew-point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.
- C. Handling: Use sling to handle valves and fire hydrants if size requires handling by crane or lift. Rig valves to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.
- D. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.

- E. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.
- F. Protect flanges, fittings, and specialties from moisture and dirt.
- G. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

#### 1.9 PROJECT CONDITIONS

- A. Interruption of Existing Water-Distribution Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water-distribution service according to requirements indicated:
  - 1. Notify Construction Manager no fewer than two days in advance of proposed interruption of service.
  - 2. Do not proceed with interruption of water-distribution service without Construction Manager's written permission.

#### 1.10 COORDINATION

- A. Coordinate connection to water main with utility company.

### PART 2 - PRODUCTS

#### 2.1 COPPER TUBE AND FITTINGS

- A. Soft Copper Tube: ASTM B 88, Type K (ASTM B 88M, Type A) and ASTM B 88, Type L (ASTM B 88M, Type B), water tube, annealed temper.
  - 1. Copper, Solder-Joint Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint pressure type. Furnish only wrought-copper fittings if indicated.
  - 2. Copper, Pressure-Seal Fittings:
    - a. Manufacturers: Subject to compliance with requirements, provide products by the following:
      - 1) Viega LLC.
    - b. NPS 2 (DN 50) and Smaller: Wrought-copper fitting with EPDM O-ring seal in each end.
    - c. NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Bronze fitting with stainless-steel grip ring and EPDM O-ring seal in each end.
- B. Hard Copper Tube: ASTM B 88, Type K (ASTM B 88M, Type A) and ASTM B 88, Type L (ASTM B 88M, Type B), water tube, drawn temper.
  - 1. Copper, Solder-Joint Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint pressure type. Furnish only wrought-copper fittings if indicated.
  - 2. Copper, Pressure-Seal Fittings:
    - a. Manufacturers: Subject to compliance with requirements, provide products by the following:
      - 1) Viega LLC.
    - b. NPS 2 (DN 50) and Smaller: Wrought-copper fitting with EPDM O-ring seal in each end.

- c. NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Bronze fitting with stainless-steel grip ring and EPDM O-ring seal in each end.
- C. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end. Furnish Class 300 flanges if required to match piping.
- D. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

## 2.2 DUCTILE-IRON PIPE AND FITTINGS

- A. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated.
  - 1. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
  - 2. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.
- B. Push-on-Joint, Ductile-Iron Pipe: AWWA C151, with push-on-joint bell and plain spigot end unless grooved or flanged ends are indicated.
  - 1. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
  - 2. Gaskets: AWWA C111, rubber.
- C. Grooved-Joint, Ductile-Iron Pipe: AWWA C151, with cut, rounded-grooved ends.
  - 1. Grooved-End, Ductile-Iron Pipe Appurtenances:
    - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) Anvil International.
      - 2) Smith-Cooper International.
      - 3) Victaulic Company.
    - b. Grooved-End, Ductile-Iron Fittings: ASTM A 47/A 47M, malleable-iron castings or ASTM A 536, ductile-iron castings with dimensions matching pipe.
    - c. Grooved-End, Ductile-Iron-Piping Couplings: AWWA C606, for ductile-iron-pipe dimensions. Include ferrous housing sections, gasket suitable for water, and bolts and nuts.
- D. Flanges: ASME 16.1, Class 125, cast iron.

## 2.3 PE PIPE AND FITTINGS

- A. PE, ASTM Pipe: ASTM D 2239, SDR No. 5.3, 7, or 9; with PE compound number required to give pressure rating not less than 160 psig (1100 kPa).
  - 1. Insert Fittings for PE Pipe: ASTM D 2609, made of PA, PP, or PVC with serrated male insert ends matching inside of pipe. Include bands or crimp rings.
  - 2. Molded PE Fittings: ASTM D 3350, PE resin, socket- or butt-fusion type, made to match PE pipe dimensions and class.
- B. PE, AWWA Pipe: AWWA C906, DR No. 7.3, 9, or 9.3; with PE compound number required to give pressure rating not less than 160 psig (1100 kPa).
  - 1. PE, AWWA Fittings: AWWA C906, socket- or butt-fusion type, with DR number matching pipe and PE compound number required to give pressure rating not less than 160 psig (1100 kPa).

## 2.4 PVC PIPE AND FITTINGS

- A. PVC, Schedule 80 Pipe: ASTM D 1785.
  - 1. PVC, Schedule 80 Socket Fittings: ASTM D 2467.
  - 2. PVC, Schedule 80 Threaded Fittings: ASTM D 2464.
- B. PVC, AWWA Pipe: AWWA C900, Class 150 and Class 200, with bell end with gasket, and with spigot end.
  - 1. Comply with UL 1285 for fire-service mains if indicated.
  - 2. PVC Fabricated Fittings: AWWA C900, Class 150 and Class 200, with bell-and-spigot or double-bell ends. Include elastomeric gasket in each bell.
  - 3. PVC Molded Fittings: AWWA C907, Class 150, with bell-and-spigot or double-bell ends. Include elastomeric gasket in each bell.
  - 4. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
    - a. Gaskets: AWWA C111, rubber.
  - 5. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
    - a. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

## 2.5 SPECIAL PIPE FITTINGS

- A. Ductile-Iron Rigid Expansion Joints:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. EBAA Iron, Inc.
    - b. U.S. Pipe and Foundry Company.
    - c. Zurn Industries, LLC.
  - 2. Description: Three-piece, ductile-iron assembly consisting of telescoping sleeve with gaskets and restrained-type, ductile-iron, bell-and-spigot end sections complying with AWWA C110 or AWWA C153. Select and assemble components for expansion indicated. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.
    - a. Pressure Rating: 250 psig (1725 kPa) minimum.
- B. Ductile-Iron Flexible Expansion Joints:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. EBAA Iron, Inc.
    - b. Hays Fluid Controls.
    - c. Star Pipe Products.
    - d. Zurn Industries, LLC.
  - 2. Description: Compound, ductile-iron fitting with combination of flanged and mechanical-joint ends complying with AWWA C110 or AWWA C153. Include two gasketed ball-joint sections and one or more gasketed sleeve sections. Assemble components for offset and expansion indicated. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.
    - a. Pressure Rating: 250 psig (1725 kPa) minimum.
- C. Ductile-Iron Deflection Fittings:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. EBAA Iron, Inc.

2. Description: Compound, ductile-iron coupling fitting with sleeve and 1 or 2 flexing sections for up to 15-degree deflection, gaskets, and restrained-joint ends complying with AWWA C110 or AWWA C153. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.
  - a. Pressure Rating: 250 psig (1725 kPa) minimum.

## 2.6 JOINING MATERIALS

- A. Brazing Filler Metals: AWS A5.8, BCuP Series.
- B. Plastic Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

## 2.7 PIPING SPECIALTIES

- A. Transition Fittings: Manufactured fitting or coupling same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.
- B. Tubular-Sleeve Pipe Couplings:
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Cascade Waterworks Mfg. Co.
    - b. Dresser, Inc.
    - c. Hays Fluid Controls.
    - d. JCM Industries, Inc.
    - e. Smith-Blair, Inc.
    - f. Viking Johnson.
  2. Description: Metal, bolted, sleeve-type, reducing or transition coupling, with center sleeve, gaskets, end rings, and bolt fasteners and with ends of same sizes as piping to be joined.
    - a. Standard: AWWA C219.
    - b. Center-Sleeve Material: Manufacturer's standard.
    - c. Gasket Material: Natural or synthetic rubber.
    - d. Pressure Rating: 150 psig (1035 kPa) minimum.
    - e. Metal Component Finish: Corrosion-resistant coating or material.
- C. Split-Sleeve Pipe Couplings:
  1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. Victaulic Company.
  2. Description: Metal, bolted, split-sleeve-type, reducing or transition coupling with sealing pad and closure plates, O-ring gaskets, and bolt fasteners.
    - a. Standard: AWWA C219.
    - b. Sleeve Material: Manufacturer's standard.
    - c. Sleeve Dimensions: Of thickness and width required to provide pressure rating.
    - d. Gasket Material: O-rings made of EPDM rubber, unless otherwise indicated.
    - e. Pressure Rating: 150 psig (1035 kPa) minimum.
    - f. Metal Component Finish: Corrosion-resistant coating or material.
- D. Flexible Connectors:
  1. Nonferrous-Metal Piping: Bronze hose covered with bronze wire braid; with copper-tube, pressure-type, solder-joint ends or bronze flanged ends brazed to hose.



2. Ferrous-Metal Piping: Stainless-steel hose covered with stainless-steel wire braid; with ASME B1.20.1, threaded steel pipe nipples or ASME B16.5, steel pipe flanges welded to hose.

E. Dielectric Fittings:

1. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
2. Dielectric Unions:
  - a. Description:
    - 1) Standard: ASSE 1079.
    - 2) Pressure Rating: 125 psig (860 kPa) minimum at 180 deg F (82 deg C).
    - 3) End Connections: Solder-joint copper alloy and threaded ferrous.
3. Dielectric Flanges:
  - a. Description:
    - 1) Standard: ASSE 1079.
    - 2) Factory-fabricated, bolted, companion-flange assembly.
    - 3) Pressure Rating: 125 psig (860 kPa) minimum at 180 deg F (82 deg C).
    - 4) End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.
4. Dielectric-Flange Insulating Kits:
  - a. Description:
    - 1) Nonconducting materials for field assembly of companion flanges.
    - 2) Pressure Rating: 150 psig (1035 kPa).
    - 3) Gasket: Neoprene or phenolic.
    - 4) Bolt Sleeves: Phenolic or polyethylene.
    - 5) Washers: Phenolic with steel backing washers.
5. Dielectric Nipples:
  - a. Description:
    - 1) Standard: IAPMO PS 66
    - 2) Electroplated steel nipple. complying with ASTM F 1545.
    - 3) Pressure Rating: 300 psig (2070 kPa) at 225 deg F (107 deg C).
    - 4) End Connections: Male threaded or grooved.
    - 5) Lining: Inert and noncorrosive, propylene.

## 2.8 CORROSION-PROTECTION PIPING ENCASEMENT

A. Encasement for Underground Metal Piping:

1. Standards: ASTM A 674 or AWWA C105.
2. Form: Sheet or tube.
3. Material: LLDPE film of 0.008-inch (0.20-mm) minimum thickness.
4. Material: LLDPE film of 0.008-inch (0.20-mm) minimum thickness, or high-density, crosslaminated PE film of 0.004-inch (0.10-mm) minimum thickness.
5. Material: High-density, crosslaminated PE film of 0.004-inch (0.10-mm) minimum thickness.
6. Color: Natural.

## 2.9 GATE VALVES

A. AWWA, Cast-Iron Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. American Cast Iron Pipe Company.
  - b. Crane; Crane Energy Flow Solutions.

- c. Flomatic Corporation.
- d. Kennedy Valve Company; a division of McWane, Inc.
- e. McWane, Inc.
- f. Mueller Co.
- g. NIBCO INC.
- h. Tyler Pipe; a subsidiary of McWane Inc.
- i. U.S. Pipe and Foundry Company.
- j. Zurn Industries, LLC.
- 2. Nonrising-Stem, Metal-Seated Gate Valves:
  - a. Description: Gray- or ductile-iron body and bonnet; with cast-iron or bronze double-disc gate, bronze gate rings, bronze stem, and stem nut.
    - 1) Standard: AWWA C500.
    - 2) Minimum Pressure Rating: 200 psig (1380 kPa).
    - 3) End Connections: Mechanical joint.
    - 4) Interior Coating: Complying with AWWA C550.
- 3. Nonrising-Stem, Resilient-Seated Gate Valves:
  - a. Description: Gray- or ductile-iron body and bonnet; with bronze or gray- or ductile-iron gate, resilient seats, bronze stem, and stem nut.
    - 1) Standard: AWWA C509.
    - 2) Minimum Pressure Rating: 200 psig (1380 kPa).
    - 3) End Connections: Mechanical joint.
    - 4) Interior Coating: Complying with AWWA C550.
- 4. Nonrising-Stem, High-Pressure, Resilient-Seated Gate Valves:
  - a. Description: Ductile-iron body and bonnet; with bronze or ductile-iron gate, resilient seats, bronze stem, and stem nut.
    - 1) Standard: AWWA C509.
    - 2) Minimum Pressure Rating: 250 psig (1725 kPa).
    - 3) End Connections: Push on or mechanical joint.
    - 4) Interior Coating: Complying with AWWA C550.
- 5. OS&Y, Rising-Stem, Metal-Seated Gate Valves:
  - a. Description: Cast- or ductile-iron body and bonnet, with cast-iron double disc, bronze disc and seat rings, and bronze stem.
    - 1) Standard: AWWA C500.
    - 2) Minimum Pressure Rating: 200 psig (1380 kPa).
    - 3) End Connections: Flanged.
- 6. OS&Y, Rising-Stem, Resilient-Seated Gate Valves:
  - a. Description: Cast- or ductile-iron body and bonnet, with bronze or gray- or ductile-iron gate, resilient seats, and bronze stem.
    - 1) Standard: AWWA C509.
    - 2) Minimum Pressure Rating: 200 psig (1380 kPa).
    - 3) End Connections: Flanged.
- B. UL/FMG, Cast-Iron Gate Valves:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. American Cast Iron Pipe Company.
    - b. Crane; Crane Energy Flow Solutions.
    - c. Kennedy Valve Company; a division of McWane, Inc.
    - d. McWane, Inc.
    - e. NIBCO INC.
    - f. U.S. Pipe and Foundry Company.
    - g. Zurn Industries, LLC.
  - 2. UL/FMG, Nonrising-Stem Gate Valves:
    - a. Description: Iron body and bonnet with flange for indicator post, bronze seating material, and inside screw.

- 1) Standards: UL 262 and FMG approved.
    - 2) Minimum Pressure Rating: 175 psig (1207 kPa).
    - 3) End Connections: Flanged.
  - 3. OS&Y, Rising-Stem Gate Valves:
    - a. Description: Iron body and bonnet and bronze seating material.
      - 1) Standards: UL 262 and FMG approved.
      - 2) Minimum Pressure Rating: 175 psig (1207 kPa).
      - 3) End Connections: Flanged.
- C. Bronze Gate Valves:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Crane; Crane Energy Flow Solutions.
    - b. Hammond Valve.
    - c. Jenkins Valves; Crane Energy Flow Solutions.
    - d. Milwaukee Valve Company.
    - e. NIBCO INC.
    - f. Red-White Valve Corporation.
    - g. Zurn Industries, LLC.
  - 2. OS&Y, Rising-Stem Gate Valves:
    - a. Description: Bronze body and bonnet and bronze stem.
      - 1) Standards: UL 262 and FMG approved.
      - 2) Minimum Pressure Rating: 175 psig (1207 kPa).
      - 3) End Connections: Threaded.
  - 3. Nonrising-Stem Gate Valves:
    - a. Description: Class 125, Type 1, bronze with solid wedge, threaded ends, and malleable-iron handwheel.
      - 1) Standard: MSS SP-80.

## 2.10 GATE VALVE ACCESSORIES AND SPECIALTIES

- A. Tapping-Sleeve Assemblies:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. American Cast Iron Pipe Company.
    - b. Clow Valve Company; a subsidiary of McWane, Inc.
    - c. Kennedy Valve Company; a division of McWane, Inc.
    - d. M & H Valve Company; a division of McWane, Inc.
    - e. Mueller Co.
    - f. U.S. Pipe and Foundry Company.
  - 2. Description: Sleeve and valve compatible with drilling machine.
    - a. Standard: MSS SP-60.
    - b. Tapping Sleeve: Cast- or ductile-iron or stainless-steel, two-piece bolted sleeve with flanged outlet for new branch connection. Include sleeve matching size and type of pipe material being tapped and with recessed flange for branch valve.
    - c. Valve: AWWA, cast-iron, nonrising-stem, resilient-seated gate valve with one raised face flange mating tapping-sleeve flange.
- B. Valve Boxes: Comply with AWWA M44 for cast-iron valve boxes. Include top section, adjustable extension of length required for depth of burial of valve, plug with lettering "WATER," and bottom section with base that fits over valve and with a barrel approximately 5 inches (125 mm) in diameter.
  - 1. Operating Wrenches: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and socket matching valve operating nut.

- C. Indicator Posts: UL 789, FMG-approved, vertical-type, cast-iron body with operating wrench, extension rod, and adjustable cast-iron barrel of length required for depth of burial of valve.

## 2.11 CHECK VALVES

### A. AWWA Check Valves:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. American AVK Co.
  - b. American Cast Iron Pipe Company.
  - c. APCO Willamette Valve and Primer Corporation.
  - d. Crane; Crane Energy Flow Solutions.
  - e. Kennedy Valve Company; a division of McWane, Inc.
  - f. McWane, Inc.
  - g. Mueller Co.
  - h. NIBCO INC.
  - i. Watts; a Watts Water Technologies company.
- 2. Description: Swing-check type with resilient seat. Include interior coating according to AWWA C550 and ends to match piping.
  - a. Standard: AWWA C508.
  - b. Pressure Rating: 175 psig (1207 kPa).

### B. UL/FMG, Check Valves:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. American Cast Iron Pipe Company.
  - b. Crane; Crane Energy Flow Solutions.
  - c. Globe Fire Sprinkler Corporation.
  - d. Kennedy Valve Company; a division of McWane, Inc.
  - e. McWane, Inc.
  - f. Mueller Co.
  - g. NIBCO INC.
  - h. Tyco Fire & Building Products LP.
  - i. United Brass Works, Inc.
  - j. Victaulic Company.
  - k. Viking Corporation.
  - l. Watts; a Watts Water Technologies company.
- 2. Description: Swing-check type with pressure rating; rubber-face checks, unless otherwise indicated; and ends matching piping.
  - a. Standards: UL 312 and FMG approved.
  - b. Pressure Rating: 175 psig (1207 kPa).

## 2.12 BUTTERFLY VALVES

### A. AWWA Butterfly Valves:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. DeZURIK/Copes-Vulcan.
  - b. Flomatic Corporation.
  - c. Milliken Valve Company.
  - d. Milwaukee Valve Company.
  - e. Mosser Valve.
  - f. Mueller Co.

- g. Pratt, Henry Company.
    - h. Val-Matic Valve & Manufacturing Corp.
  - 2. Description: Rubber seated.
    - a. Standard: AWWA C504.
    - b. Body: Cast or ductile iron.
    - c. Body Type: Wafer or flanged.
    - d. Pressure Rating: 150 psig (1035 kPa).
- B. UL Butterfly Valves:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Kennedy Valve Company; a division of McWane, Inc.
    - b. McWane, Inc.
    - c. Milwaukee Valve Company.
    - d. Mueller Co.
    - e. NIBCO INC.
    - f. Pratt, Henry Company.
  - 2. Description: Metal on resilient material seating.
    - a. Standards: UL 1091 and FMG approved.
    - b. Body: Cast or ductile iron.
    - c. Body Type: Wafer or flanged.
    - d. Pressure Rating: 175 psig (1207 kPa).

## 2.13 PLUG VALVES

- A. Plug Valves:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. DeZURIK/Copes-Vulcan.
    - b. Homestead Valve.
    - c. M & H Valve Company; a division of McWane, Inc.
    - d. McWane, Inc.
    - e. Milliken Valve Company.
    - f. Pratt, Henry Company.
    - g. Val-Matic Valve & Manufacturing Corp.
  - 2. Description: Resilient-seated eccentric.
    - a. Standard: MSS SP-108.
    - b. Body: Cast iron.
    - c. Pressure Rating: 175-psig (1207-kPa) minimum CWP.
    - d. Seat Material: Suitable for potable-water service.

## 2.14 PRESSURE-REDUCING VALVES

- A. Water Regulators:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Cash Acme.
    - b. Conbraco Industries, Inc.
    - c. Honeywell Water Controls.
    - d. Watts; a Watts Water Technologies company.
    - e. Wilkins.
    - f. Zurn Industries, LLC.
  - 2. Standard: ASSE 1003.
  - 3. Pressure Rating: Initial pressure of 150 psig (1035 kPa).

4. Body: Bronze for NPS 2 (DN 50) and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved for NPS 2-1/2 and NPS 3 (DN 65 and DN 80).
5. Valves for Booster Heater Water Supply: Include integral bypass.
6. End Connections: Threaded for NPS 2 (DN 50) and smaller; flanged for NPS 2-1/2 and NPS 3 (DN 65 and DN 80).

## 2.15 RELIEF VALVES

### A. Air-Release Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Crispin-Multiplex Manufacturing Co.
  - b. GA Industries, Inc.
  - c. Val-Matic Valve & Manufacturing Corp.
2. Description: Hydromechanical device to automatically release accumulated air.
  - a. Standard: AWWA C512.
  - b. Pressure Rating: 300 psig (2070 kPa).
  - c. Body Material: Cast iron.
  - d. Trim Material: Stainless steel, brass, or bronze.

### B. Air/Vacuum Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Crispin-Multiplex Manufacturing Co.
  - b. GA Industries, Inc.
  - c. Val-Matic Valve & Manufacturing Corp.
2. Description: Direct-acting, float-operated, hydromechanical device with large orifice to automatically release accumulated air or to admit air during filling of piping.
  - a. Standard: AWWA C512.
  - b. Pressure Rating: 300 psig (2070 kPa).
  - c. Body Material: Cast iron.
  - d. Trim Material: Stainless steel, brass, or bronze.

## 2.16 VACUUM BREAKERS

### A. Pressure Vacuum Breaker Assembly:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Ames Fire & Waterworks.
  - b. Conbraco Industries, Inc.
  - c. FEBCO.
  - d. Flowmatic Corporation.
  - e. Toro Company (The).
  - f. Watts; a Watts Water Technologies company.
  - g. Wilkins.
  - h. Zurn Industries, LLC.
2. Standard: ASSE 1020.
3. Operation: Continuous-pressure applications.
4. Pressure Loss: 5 psig (35 kPa) maximum, through middle 1/3 of flow range.
5. Accessories: Ball valves on inlet and outlet.

## 2.17 BACKFLOW PREVENTERS

- A. Reduced-Pressure-Principle Backflow Preventers:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Ames Fire & Waterworks.
    - b. Watts; a Watts Water Technologies company.
    - c. Wilkins.
    - d. Zurn Industries, LLC.
  2. Standard: ASSE 1013 or AWWA C511.
  3. Operation: Continuous-pressure applications.
  4. Pressure Loss: 12 psig (83 kPa) maximum, through middle 1/3 of flow range.
  5. Body: Bronze for NPS 2 (DN 50) and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved for NPS 2-1/2 (DN 65) and larger.
  6. End Connections: Threaded for NPS 2 (DN 50) and smaller; flanged for NPS 2-1/2 (DN 65) and larger.
  7. Configuration: Designed for horizontal, straight through flow.
  8. Accessories:
    - a. Valves: Ball type with threaded ends on inlet and outlet of NPS 2 (DN 50) and smaller; OS&Y gate type with flanged ends on inlet and outlet of NPS 2-1/2 (DN 65) and larger.
    - b. Air-Gap Fitting: ASME A112.1.2, matching backflow preventer connection.
- B. Double-Check, Backflow-Prevention Assemblies:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Ames Fire & Waterworks.
    - b. Watts; a Watts Water Technologies company.
    - c. Wilkins.
    - d. Zurn Industries, LLC.
  2. Standard: ASSE 1015 or AWWA C510.
  3. Operation: Continuous-pressure applications, unless otherwise indicated.
  4. Pressure Loss: 5 psig (35 kPa) maximum, through middle 1/3 of flow range.
  5. Body: Bronze for NPS 2 (DN 50) and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved for NPS 2-1/2 (DN 65) and larger.
  6. End Connections: Threaded for NPS 2 (DN 50) and smaller; flanged for NPS 2-1/2 (DN 65) and larger.
  7. Configuration: Designed for horizontal, straight through flow.
  8. Accessories: Ball valves with threaded ends on inlet and outlet of NPS 2 (DN 50) and smaller; OS&Y gate valves with flanged ends on inlet and outlet of NPS 2-1/2 (DN 65) and larger.
- C. Backflow Preventer Test Kits:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Flowmatic Corporation.
    - b. Watts; a Watts Water Technologies company.
    - c. Wilkins.
    - d. Zurn Industries, LLC.
  2. Description: Factory calibrated, with gages, fittings, hoses, and carrying case with test-procedure instructions.

## PART 3 - EXECUTION

## 3.1 EARTHWORK

- A. Refer to Section 310020 "Earthwork" for excavating, trenching, and backfilling.

## 3.2 PIPING APPLICATIONS

- A. General: Use pipe, fittings, and joining methods for piping systems according to the following applications.
- B. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used, unless otherwise indicated.
- C. Do not use flanges or unions for underground piping.
- D. Flanges, unions, grooved-end-pipe couplings, and special fittings may be used, instead of joints indicated, on aboveground piping and piping in vaults.
- E. Underground water-service piping NPS 3/4 to NPS 3 (DN 20 to DN 80) shall be any of the following:
  - 1. Soft copper tube, ASTM B 88, Type K (ASTM B 88M, Type A); wrought-copper, solder-joint fittings; and brazed joints.
  - 2. PE, ASTM pipe; insert fittings for PE pipe; and clamped joints.
  - 3. PVC, Schedule 80 pipe; PVC, Schedule 80 socket fittings; and solvent-cemented joints.
- F. Underground water-service piping NPS 4 to NPS 8 (DN 100 to DN 200) shall be any of the following:
  - 1. Soft copper tube, ASTM B 88, Type K (ASTM B 88M, Type A); wrought-copper, solder-joint fittings; and brazed joints.
  - 2. Ductile-iron, push-on-joint pipe; ductile-iron, push-on-joint fittings; and gasketed joints.
  - 3. PE, AWWA pipe; PE, AWWA fittings; and heat-fusion joints.
  - 4. PVC, Schedule 80 pipe; PVC, Schedule 80 socket fittings; and solvent-cemented joints.
  - 5. NPS 4 and NPS 6 (DN 100 and DN 150): NPS 6 (DN 150) PVC, AWWA Class 150 pipe; PVC, AWWA Class 150 fabricated or molded fittings; and gasketed joints.
  - 6. NPS 8 (DN 200): PVC, AWWA Class 200 pipe; push-on-joint, ductile-iron fittings; and gasketed joints.
- G. Aboveground Water-Service Piping NPS 3/4 to NPS 3 (DN 20 to DN 80) shall be any of the following:
  - 1. Hard copper tube, ASTM B 88, Type K (ASTM B 88M, Type A); wrought-copper, solder-joint fittings; and brazed joints.
  - 2. PVC, Schedule 80 pipe; PVC, Schedule 80 socket fittings; and solvent-cemented joints.
- H. Above groundwater-service piping NPS 4 to NPS 8 (DN 100 to DN 200) shall be any of the following:
  - 1. Hard copper tube, ASTM B 88, Type K (ASTM B 88M, Type A); wrought-copper, solder-joint fittings; and brazed joints.
  - 2. Ductile-iron, grooved-end pipe; ductile-iron, grooved-end appurtenances; and grooved joints.
  - 3. PVC, Schedule 80 pipe; PVC, Schedule 80 socket fittings; and solvent-cemented joints.



### 3.3 VALVE APPLICATIONS

- A. General Application: Use mechanical-joint-end valves for NPS 3 (DN 80) and larger underground installation. Use threaded- or flanged-end valves for installation in vaults. Use UL/FMG, nonrising-stem gate valves for installation with indicator posts. Use corporation valves and curb valves with ends compatible with piping, for NPS 2 (DN 50) and smaller installation.
- B. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
  - 1. Underground Valves, NPS 3 (DN 80) and Larger: AWWA, cast-iron, nonrising-stem, resilient-seated gate valves with valve box.
  - 2. Underground Valves, NPS 4 (DN 100) and Larger, for Indicator Posts: UL/FMG, cast-iron, nonrising-stem gate valves with indicator post.
  - 3. Use the following for valves in vaults and aboveground:
    - a. Gate Valves, NPS 2 (DN 50) and Smaller: Bronze, nonrising stem.
    - b. Gate Valves, NPS 3 (DN 80) and Larger: AWWA, cast iron, OS&Y rising stem, resilient seated.
    - c. Check Valves: AWWA C508, swing type.
  - 4. Pressure-Reducing Valves: Use for water-service piping in vaults and aboveground to control water pressure.
  - 5. Relief Valves: Use for water-service piping in vaults and aboveground.
    - a. Air-Release Valves: To release accumulated air.
    - b. Air/Vacuum Valves: To release or admit large volume of air during filling of piping.
    - c. Combination Air Valves: To release or admit air.

### 3.4 PIPING INSTALLATION

- A. Water-Main Connection: Arrange with utility company for tap of size and in location indicated in water main.
- B. Water-Main Connection: Tap water main according to requirements of water utility company and of size and in location indicated.
- C. Make connections larger than NPS 2 (DN 50) with tapping machine according to the following:
  - 1. Install tapping sleeve and tapping valve according to MSS SP-60.
  - 2. Install tapping sleeve on pipe to be tapped. Position flanged outlet for gate valve.
  - 3. Use tapping machine compatible with valve and tapping sleeve; cut hole in main. Remove tapping machine and connect water-service piping.
  - 4. Install gate valve onto tapping sleeve. Comply with MSS SP-60. Install valve with stem pointing up and with valve box.
- D. Make connections NPS 2 (DN 50) and smaller with drilling machine according to the following:
  - 1. Install service-saddle assemblies and corporation valves in size, quantity, and arrangement required by utility company standards.
  - 2. Install service-saddle assemblies on water-service pipe to be tapped. Position outlets for corporation valves.
  - 3. Use drilling machine compatible with service-saddle assemblies and corporation valves. Drill hole in main. Remove drilling machine and connect water-service piping.
  - 4. Install corporation valves into service-saddle assemblies.
  - 5. Install manifold for multiple taps in water main.
  - 6. Install curb valve in water-service piping with head pointing up and with service box.

- E. Comply with NFPA 24 for fire-service-main piping materials and installation.
  - 1. Install PE corrosion-protection encasement according to ASTM A 674 or AWWA C105.
  - 2. Install copper tube and fittings according to CDA's "Copper Tube Handbook."
- F. Install ductile-iron, water-service piping according to AWWA C600 and AWWA M41.
  - 1. Install PE corrosion-protection encasement according to ASTM A 674 or AWWA C105.
- G. Install PE pipe according to ASTM D 2774 and ASTM F 645.
- H. Install PVC, AWWA pipe according to ASTM F 645 and AWWA M23.
- I. Install piping by tunneling or jacking, or combination of both, under streets and other obstructions that cannot be disturbed.
- J. Extend water-service piping and connect to water-supply source and building-water-piping systems at outside face of building wall in locations and pipe sizes indicated.
  - 1. Terminate water-service piping at building wall until building-water-piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to building-water-piping systems when those systems are installed.
- K. Sleeves are specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- L. Mechanical sleeve seals are specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- M. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.
- N. See Section 221116 "Domestic Water Piping" for potable-water piping inside the building.

### 3.5 JOINT CONSTRUCTION

- A. Make pipe joints according to the following:
  - 1. Copper-Tubing, Pressure-Sealed Joints: Use proprietary crimping tool and procedure recommended by copper, pressure-seal-fitting manufacturer.
  - 2. Ductile-Iron Piping, Gasketed Joints for Water-Service Piping: AWWA C600 and AWWA M41.
  - 3. Ductile-Iron Piping, Gasketed Joints for Fire-Service-Main Piping: UL 194.
  - 4. Ductile-Iron Piping, Grooved Joints: Cut-groove pipe. Assemble joints with grooved-end, ductile-iron-piping couplings, gaskets, lubricant, and bolts according to coupling manufacturer's written instructions.
  - 5. PE Piping Insert-Fitting Joints: Use plastic insert fittings and fasteners according to fitting manufacturer's written instructions.
  - 6. PVC Piping Gasketed Joints: Use joining materials according to AWWA C900. Construct joints with elastomeric seals and lubricant according to ASTM D 2774 or ASTM D 3139 and pipe manufacturer's written instructions.
  - 7. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
    - a. Dielectric Fittings for NPS 2 (DN 50) and Smaller: Use dielectric unions.
    - b. Dielectric Fittings for NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Use dielectric flanges.
    - c. Dielectric Fittings for NPS 5 (DN 125) and Larger: Use dielectric flange kits.

### 3.6 ANCHORAGE INSTALLATION

- A. Anchorage, General: Install water-distribution piping with restrained joints. Anchorages and restrained-joint types that may be used include the following:
  - 1. Concrete thrust blocks.
  - 2. Locking mechanical joints.
  - 3. Set-screw mechanical retainer glands.
  - 4. Bolted flanged joints.
  - 5. Heat-fused joints.
  - 6. Pipe clamps and tie rods.
- B. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches. Include anchorages for the following piping systems:
  - 1. Gasketed-Joint, Ductile-Iron, Water-Service Piping: According to AWWA C600.
  - 2. Gasketed-Joint, PVC Water-Service Piping: According to AWWA M23.
  - 3. Bonded-Joint Fiberglass, Water-Service Piping: According to AWWA M45.
  - 4. Fire-Service-Main Piping: According to NFPA 24.
- C. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

### 3.7 VALVE INSTALLATION

- A. AWWA Gate Valves: Comply with AWWA C600 and AWWA M44. Install each underground valve with stem pointing up and with valve box.
- B. AWWA Valves Other Than Gate Valves: Comply with AWWA C600 and AWWA M44.
- C. UL/FMG, Gate Valves: Comply with NFPA 24. Install each underground valve and valves in vaults with stem pointing up and with vertical cast-iron indicator post.
- D. UL/FMG, Valves Other Than Gate Valves: Comply with NFPA 24.
- E. MSS Valves: Install as component of connected piping system.
- F. Corporation Valves and Curb Valves: Install each underground curb valve with head pointed up and with service box.
- G. Pressure-Reducing Valves: Install in vault or aboveground between shutoff valves. Install full-size valved bypass.
- H. Relief Valves: Comply with AWWA C512. Install aboveground with shutoff valve on inlet.

### 3.8 VACUUM BREAKER ASSEMBLY INSTALLATION

- A. Install pressure vacuum breaker assemblies of type, size, and capacity indicated. Include valves and test cocks. Install according to requirements of plumbing and health department and authorities having jurisdiction.
- B. Do not install pressure vacuum breaker assemblies in vault or other space subject to flooding.

### 3.9 BACKFLOW PREVENTER INSTALLATION

- A. Install backflow preventers of type, size, and capacity indicated. Include valves and test cocks. Install according to requirements of plumbing and health department and authorities having jurisdiction.
- B. Do not install backflow preventers that have relief drain in vault or in other spaces subject to flooding.
- C. Do not install bypass piping around backflow preventers.
- D. Support NPS 2-1/2 (DN 65) and larger backflow preventers, valves, and piping near floor and on brick or concrete piers.

### 3.10 CONNECTIONS

- A. Connect water-distribution piping to utility water main. Use tapping sleeve and tapping valve.
- B. Connect water-distribution piping to interior domestic water piping.
- C. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
- D. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

### 3.11 FIELD QUALITY CONTROL

- A. Piping Tests: Conduct piping tests before joints are covered and after concrete thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.
- B. Hydrostatic Tests: Test at not less than one-and-one-half times working pressure for two hours.
  - 1. Increase pressure in 50-psig (350-kPa) increments and inspect each joint between increments. Hold at test pressure for 1 hour; decrease to 0 psig (0 kPa). Slowly increase again to test pressure and hold for 1 more hour. Maximum allowable leakage is 2 quarts (1.89 L) per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.
- C. Prepare reports of testing activities.

### 3.12 IDENTIFICATION

- A. Install continuous underground detectable warning tape during backfilling of trench for underground water-distribution piping. Locate below finished grade, directly over piping. Underground warning tapes are specified in Section 310020 "Earthwork."
- B. Permanently attach equipment nameplate or marker indicating plastic water-service piping, on main electrical meter panel.

## 3.13 CLEANING

- A. Clean and disinfect water-distribution piping as follows:
  - 1. Purge new water-distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.
  - 2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in NFPA 24 for flushing of piping. Flush piping system with clean, potable water until dirty water does not appear at points of outlet.
  - 3. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in AWWA C651 or do as follows:
    - a. Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine; isolate and allow to stand for 24 hours.
    - b. Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow to stand for 3 hours.
    - c. After standing time, flush system with clean, potable water until no chlorine remains in water coming from system.
    - d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.
- B. Prepare reports of purging and disinfecting activities.

END OF SECTION 221113

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 221113 – FACILITY WATER DISTRIBUTION PIPING

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the facility water distribution piping is installed and is in general conformance with the Contract Documents, applicable Codes, and shop drawings. The facility water distribution piping has been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

FACILITY WATER DISTRIBUTION PIPING INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_

## SECTION 221116 - DOMESTIC WATER PIPING

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Under-building-slab and aboveground domestic water pipes, tubes, and fittings inside buildings.
  - 2. Encasement for piping.
- B. Related Requirements:
  - 1. Section 221113 "Facility Water Distribution Piping" for water-service piping outside the building from source to the point where water-service piping enters the building.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For transition fittings and dielectric fittings.

## 1.4 INFORMATIONAL SUBMITTALS

- A. System purging and disinfecting activities report.
- B. Field quality-control reports.

## 1.5 FIELD CONDITIONS

- A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water service according to requirements indicated:
  - 1. Notify Construction Manager no fewer than two days in advance of proposed interruption of water service.
  - 2. Do not interrupt water service without Construction Manager's written permission.

## PART 2 - PRODUCTS

## 2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

- B. Potable-water piping and components shall comply with NSF 14 and NSF 61 Annex G. Plastic piping components shall be marked with "NSF-pw."

## 2.2 COPPER TUBE AND FITTINGS

- A. Hard Copper Tube: ASTM B 88, Type L (ASTM B 88M, Type B) and ASTM B 88, Type M (ASTM B 88M, Type C) water tube, drawn temper.
- B. Soft Copper Tube: ASTM B 88, Type K (ASTM B 88M, Type A) and ASTM B 88, Type L (ASTM B 88M, Type B) water tube, annealed temper.
- C. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings.
- D. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
- E. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
- F. Copper Unions:
  - 1. MSS SP-123.
  - 2. Cast-copper-alloy, hexagonal-stock body.
  - 3. Ball-and-socket, metal-to-metal seating surfaces.
  - 4. Solder-joint or threaded ends.
- G. Copper Pressure-Seal-Joint Fittings:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Elkhart Products Corporation.
    - b. NIBCO INC.
    - c. Viega LLC.
  - 2. Fittings for NPS 2 (DN 50) and Smaller: Wrought-copper fitting with EPDM-rubber, O-ring seal in each end.
  - 3. Fittings for NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Cast-bronze or wrought-copper fitting with EPDM-rubber, O-ring seal in each end.
- H. Copper Push-on-Joint Fittings:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. Victaulic Company.
  - 2. Description:
    - a. Cast-copper fitting complying with ASME B16.18 or wrought-copper fitting complying with ASME B 16.22.
    - b. Stainless-steel teeth and EPDM-rubber, O-ring seal in each end instead of solder-joint ends.
- I. Appurtenances for Grooved-End Copper Tubing:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Anvil International.
    - b. Shurjoint Piping Products.
    - c. Victaulic Company.
  - 2. Bronze Fittings for Grooved-End, Copper Tubing: ASTM B 75 (ASTM B 75M) copper tube or ASTM B 584 bronze castings.
  - 3. Mechanical Couplings for Grooved-End Copper Tubing:
    - a. Copper-tube dimensions and design similar to AWWA C606.



- b. Ferrous housing sections.
- c. EPDM-rubber gaskets suitable for hot and cold water.
- d. Bolts and nuts.
- e. Minimum Pressure Rating: 300 psig (2070 kPa).

## 2.3 DUCTILE-IRON PIPE AND FITTINGS

- A. Mechanical-Joint, Ductile-Iron Pipe:
  - 1. AWWA C151/A21.51, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated.
  - 2. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.
- B. Standard-Pattern, Mechanical-Joint Fittings:
  - 1. AWWA C110/A21.10, ductile or gray iron.
  - 2. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.
- C. Compact-Pattern, Mechanical-Joint Fittings:
  - 1. AWWA C153/A21.53, ductile iron.
  - 2. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.
- D. Push-on-Joint, Ductile-Iron Pipe:
  - 1. AWWA C151/A21.51.
  - 2. Push-on-joint bell and plain spigot end unless grooved or flanged ends are indicated.
- E. Standard-Pattern, Push-on-Joint Fittings:
  - 1. AWWA C110/A21.10, ductile or gray iron.
  - 2. Gaskets: AWWA C111/A21.11, rubber.
- F. Compact-Pattern, Push-on-Joint Fittings:
  - 1. AWWA C153/A21.53, ductile iron.
  - 2. Gaskets: AWWA C111/A21.11, rubber.
- G. Plain-End, Ductile-Iron Pipe: AWWA C151/A21.51.
- H. Appurtenances for Grooved-End, Ductile-Iron Pipe:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Shurjoint Piping Products.
    - b. Smith-Cooper International.
    - c. Star Pipe Products.
    - d. Victaulic Company.
  - 2. Fittings for Grooved-End, Ductile-Iron Pipe: ASTM A 47/A 47M, malleable-iron castings or ASTM A 536, ductile-iron castings with dimensions that match pipe.
  - 3. Mechanical Couplings for Grooved-End, Ductile-Iron-Piping:
    - a. AWWA C606 for ductile-iron-pipe dimensions.
    - b. Ferrous housing sections.
    - c. EPDM-rubber gaskets suitable for hot and cold water.
    - d. Bolts and nuts.
    - e. Minimum Pressure Rating:
      - 1) NPS 14 to NPS 18 (DN 350 to DN 450): 250 psig (1725 kPa).
      - 2) NPS 20 to NPS 46 (DN 500 to DN 900): 150 psig (1035 kPa).

## 2.4 CPVC PIPING

- A. CPVC Pipe: ASTM F 441/F 441M, Schedule 40 and Schedule 80.
  - 1. CPVC Socket Fittings: ASTM F 438 for Schedule 40 and ASTM F 439 for Schedule 80.
  - 2. CPVC Threaded Fittings: ASTM F 437, Schedule 80.
- B. CPVC Piping System: ASTM D 2846/D 2846M, SDR 11, pipe and socket fittings.
- C. CPVC Tubing System: ASTM D 2846/D 2846M, SDR 11, tube and socket fittings.

## 2.5 PEX TUBE AND FITTINGS

- A. PEX Distribution System: ASTM F 877, SDR 9 tubing.
- B. Fittings for PEX Tube: ASTM F 1807, metal-insert type with copper or stainless-steel crimp rings and matching PEX tube dimensions.
- C. Manifold: Multiple-outlet, plastic or corrosion-resistant-metal assembly complying with ASTM F 877; with plastic or corrosion-resistant-metal valve for each outlet.

## 2.6 PEX-AL-PEX TUBE AND FITTINGS

- A. PEX-AL-PEX Distribution System: ASTM F 1281 tubing.
- B. Fittings for PEX-AL-PEX Tube: ASTM F 1281, metal-insert type with copper or stainless-steel crimp rings and matching PEX-AL-PEX tube dimensions.

## 2.7 PEX-AL-HDPE TUBE AND FITTINGS

- A. PEX-AL-HPDE Distribution System: ASTM F 1986 tubing.
- B. Fittings for PEX-AL-HDPE Tube: ASTM F 1986, metal-insert type with copper or stainless-steel crimp ring and matching PEX-AL-HDPE tube dimensions

## 2.8 PVC PIPE AND FITTINGS

- A. PVC Pipe: ASTM D 1785, Schedule 40 and Schedule 80.
- B. PVC Socket Fittings: ASTM D 2466 for Schedule 40 and ASTM D 2467 for Schedule 80.
- C. PVC Schedule 80 Threaded Fittings: ASTM D 2464.

## 2.9 PP PIPE AND FITTINGS

- A. PP Pipe: ASTM F 2389, SDR 7.4 and SDR 11.
- B. PVC Socket Fittings: ASTM F 2389.

## 2.10 PIPING JOINING MATERIALS

- A. Pipe-Flange Gasket Materials:
  - 1. AWWA C110/A21.10, rubber, flat face, 1/8 inch (3.2 mm) thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
  - 2. Full-face or ring type unless otherwise indicated.
- B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.
- C. Solder Filler Metals: ASTM B 32, lead-free alloys.
- D. Flux: ASTM B 813, water flushable.
- E. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.
- F. Solvent Cements for Joining CPVC Piping and Tubing: ASTM F 493.
  - 1. CPVC solvent cement shall have a VOC content of 490 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  - 2. Adhesive primer shall have a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  - 3. Solvent cement and adhesive primer shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- G. Solvent Cements for Joining PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
  - 1. PVC solvent cement shall have a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  - 2. Adhesive primer shall have a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  - 3. Solvent cement and adhesive primer shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- H. Plastic, Pipe-Flange Gaskets, Bolts, and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.

## 2.11 ENCASEMENT FOR PIPING

- A. Standard: ASTM A 674 or AWWA C105/A21.5.
- B. Form: Sheet or tube.
- C. Color: Black or natural.

## 2.12 TRANSITION FITTINGS

- A. General Requirements:
  - 1. Same size as pipes to be joined.
  - 2. Pressure rating at least equal to pipes to be joined.

3. End connections compatible with pipes to be joined.
- B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
- C. Sleeve-Type Transition Coupling: AWWA C219.
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Cascade Waterworks Mfg. Co.
    - b. Dresser, Inc.
    - c. Romac Industries, Inc.
    - d. Smith, Jay R. Mfg. Co.
    - e. Smith-Blair, Inc.
    - f. Viking Johnson.
- D. Plastic-to-Metal Transition Fittings:
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Charlotte Pipe and Foundry Company.
    - b. Spears Manufacturing Company.
    - c. Uponor.
  2. Description:
    - a. CPVC or PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions.
    - b. One end with threaded brass insert and one solvent-cement-socket end.
- E. Plastic-to-Metal Transition Unions:
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Colonial Engineering, Inc.
    - b. NIBCO INC.
    - c. Spears Manufacturing Company.
  2. Description:
    - a. CPVC or PVC four-part union.
    - b. Brass threaded end.
    - c. Solvent-cement-joint plastic end.
    - d. Rubber O-ring.
    - e. Union nut.

## 2.13 DIELECTRIC FITTINGS

- A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
- B. Dielectric Unions:
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Capitol Manufacturing Company.
    - b. HART Industrial Unions, LLC.
    - c. Jomar Valve.
    - d. Watts; a Watts Water Technologies company.
    - e. Wilkins.
    - f. Zurn Industries, LLC.

2. Standard: ASSE 1079.
  3. Pressure Rating: 150 psig (1035 kPa).
  4. End Connections: Solder-joint copper alloy and threaded ferrous.
- C. Dielectric Flanges:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Capitol Manufacturing Company.
    - b. Central Plastics Company.
    - c. Watts; a Watts Water Technologies company.
    - d. Wilkins.
    - e. Zurn Industries, LLC.
  2. Standard: ASSE 1079.
  3. Factory-fabricated, bolted, companion-flange assembly.
  4. Pressure Rating: 150 psig (1035 kPa).
  5. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.
- D. Dielectric-Flange Insulating Kits:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Advance Products & Systems, Inc.
    - b. Calpico, Inc.
    - c. Central Plastics Company.
    - d. Pipeline Seal and Insulator, Inc.
  2. Nonconducting materials for field assembly of companion flanges.
  3. Pressure Rating: 150 psig (1035 kPa).
  4. Gasket: Neoprene or phenolic.
  5. Bolt Sleeves: Phenolic or polyethylene.
  6. Washers: Phenolic with steel backing washers.
- E. Dielectric Nipples:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Elster Perfection Corporation.
    - b. Grinnell Mechanical Products.
    - c. Precision Plumbing Products.
    - d. Victaulic Company.
  2. Standard: IAPMO PS 66.
  3. Electroplated steel nipple complying with ASTM F 1545.
  4. Pressure Rating and Temperature: 300 psig (2070 kPa) at 225 deg F (107 deg C).
  5. End Connections: Male threaded or grooved.
  6. Lining: Inert and noncorrosive, propylene.

## PART 3 - EXECUTION

### 3.1 EARTHWORK

- A. Comply with requirements in Section 310020 "Earthwork" for excavating, trenching, and backfilling.

### 3.2 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."
- C. Install ductile-iron piping under building slab with restrained joints according to AWWA C600 and AWWA M41.
- D. Install underground copper tube and ductile-iron pipe in PE encasement according to ASTM A 674 or AWWA C105/A21.5.
- E. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve inside the building at each domestic water-service entrance. Comply with requirements for pressure gages in Section 220519 "Meters and Gages for Plumbing Piping" and with requirements for drain valves and strainers in Section 221119 "Domestic Water Piping Specialties."
- F. Install shutoff valve immediately upstream of each dielectric fitting.
- G. Install water-pressure-reducing valves downstream from shutoff valves. Comply with requirements for pressure-reducing valves in Section 221119 "Domestic Water Piping Specialties."
- H. Install domestic water piping level with 0.25 percent slope downward toward drain and plumb.
- I. Rough-in domestic water piping for water-meter installation according to utility company's requirements.
- J. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- K. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.
- L. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- M. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.
- N. Install piping to permit valve servicing.
- O. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.
- P. Install piping free of sags and bends.
- Q. Install fittings for changes in direction and branch connections.
- R. Install PEX piping with loop at each change of direction of more than 90 degrees.

- S. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.
- T. Install pressure gages on suction and discharge piping for each plumbing pump and packaged booster pump. Comply with requirements for pressure gages in Section 220519 "Meters and Gages for Plumbing Piping."
- U. Install thermostats in hot-water circulation piping. Comply with requirements for thermostats in Section 221123 "Domestic Water Pumps."
- V. Install thermometers on outlet piping from each water heater. Comply with requirements for thermometers in Section 220519 "Meters and Gages for Plumbing Piping."
- W. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- X. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- Y. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

### 3.3 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
  - 1. Apply appropriate tape or thread compound to external pipe threads.
  - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- D. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Brazed Joints" chapter.
- E. Soldered Joints for Copper Tubing: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."
- F. Pressure-Sealed Joints for Copper Tubing: Join copper tube and pressure-seal fittings with tools recommended by fitting manufacturer.
- G. Push-on Joints for Copper Tubing: Clean end of tube. Measure insertion depth with manufacturer's depth gage. Join copper tube and push-on-joint fittings by inserting tube to measured depth.
- H. Joint Construction for Grooved-End Copper Tubing: Make joints according to AWWA C606. Roll groove ends of tubes. Lubricate and install gasket over ends of tubes or tube and fitting. Install coupling housing sections over gasket with keys seated in tubing grooves. Install and tighten housing bolts.

- I. Joint Construction for Grooved-End, Ductile-Iron Piping: Make joints according to AWWA C606. Cut round-bottom grooves in ends of pipe at gasket-seat dimension required for specified (flexible or rigid) joint. Lubricate and install gasket over ends of pipes or pipe and fitting. Install coupling housing sections over gasket with keys seated in piping grooves. Install and tighten housing bolts.
- J. Joint Construction for Grooved-End Steel Piping: Make joints according to AWWA C606. Square cut groove ends of pipe as specified. Lubricate and install gasket over ends of pipes or pipe and fitting. Install coupling housing sections over gasket with keys seated in piping grooves. Install and tighten housing bolts.
- K. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.
- L. Joint Construction for Solvent-Cemented Plastic Piping: Clean and dry joining surfaces. Join pipe and fittings according to the following:
  - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements. Apply primer.
  - 2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
  - 3. PVC Piping: Join according to ASTM D 2855.
- M. Joints for PEX Piping: Join according to ASTM F 1807.
- N. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

### 3.4 TRANSITION FITTING INSTALLATION

- A. Install transition couplings at joints of dissimilar piping.
- B. Transition Fittings in Underground Domestic Water Piping:
  - 1. Fittings for NPS 1-1/2 (DN 40) and Smaller: Fitting-type coupling.
  - 2. Fittings for NPS 2 (DN 50) and Larger: Sleeve-type coupling.
- C. Transition Fittings in Aboveground Domestic Water Piping NPS 2 (DN 50) and Smaller: Plastic-to-metal transition fittings or unions.

### 3.5 DIELECTRIC FITTING INSTALLATION

- A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
- B. Dielectric Fittings for NPS 2 (DN 50) and Smaller: Use dielectric couplings or nipples.
- C. Dielectric Fittings for NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Use dielectric flanges.
- D. Dielectric Fittings for NPS 5 (DN 125) and Larger: Use dielectric flange kits.

### 3.6 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for seismic-restraint devices in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."



- B. Comply with requirements for pipe hanger, support products, and installation in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
  - 1. Vertical Piping: MSS Type 8 or 42, clamps.
  - 2. Individual, Straight, Horizontal Piping Runs:
    - a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
    - b. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.
    - c. Longer Than 100 Feet (30 m) if Indicated: MSS Type 49, spring cushion rolls.
  - 3. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
  - 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- C. Support vertical piping and tubing at base and at each floor.
- D. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch (10 mm).
- E. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
  - 1. NPS 3/4 (DN 20) and Smaller: 60 inches (1500 mm) with 3/8-inch (10-mm) rod.
  - 2. NPS 1 and NPS 1-1/4 (DN 25 and DN 32): 72 inches (1800 mm) with 3/8-inch (10-mm) rod.
  - 3. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 96 inches (2400 mm) with 3/8-inch (10-mm) rod.
  - 4. NPS 2-1/2 (DN 65): 108 inches (2700 mm) with 1/2-inch (13-mm) rod.
  - 5. NPS 3 to NPS 5 (DN 80 to DN 125): 10 feet (3 m) with 1/2-inch (13-mm) rod.
  - 6. NPS 6 (DN 150): 10 feet (3 m) with 5/8-inch (16-mm) rod.
  - 7. NPS 8 (DN 200): 10 feet (3 m) with 3/4-inch (19-mm) rod.
- F. Install supports for vertical copper tubing every 10 feet (3 m).
- G. Install vinyl-coated hangers for CPVC piping with the following maximum horizontal spacing and minimum rod diameters:
  - 1. NPS 1 (DN 25) and Smaller: 36 inches (900 mm) with 3/8-inch (10-mm) rod.
  - 2. NPS 1-1/4 to NPS 2 (DN 32 to DN 50): 48 inches (1200 mm) with 3/8-inch (10-mm) rod.
  - 3. NPS 2-1/2 to NPS 3-1/2 (DN 65 to DN 90): 48 inches (1200 mm) with 1/2-inch (13-mm) rod.
  - 4. NPS 4 and NPS 5 (DN 100 and DN 125): 48 inches (1200 mm) with 5/8-inch (16-mm) rod.
  - 5. NPS 6 (DN 150): 48 inches (1200 mm) with 3/4-inch (19-mm) rod.
  - 6. NPS 8 (DN 200): 48 inches (1200 mm) with 7/8-inch (22-mm) rod.
- H. Install supports for vertical CPVC piping every 60 inches (1500 mm) for NPS 1 (DN 25) and smaller, and every 72 inches (1800 mm) for NPS 1-1/4 (DN 32) and larger.
- I. Install vinyl-coated hangers for PEX piping with the following maximum horizontal spacing and minimum rod diameters:
  - 1. NPS 1 (DN 25) and Smaller: 32 inches (815 mm) with 3/8-inch (10-mm) rod.
- J. Install hangers for vertical PEX piping every 48 inches (1200 mm).
- K. Install vinyl-coated hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:
  - 1. NPS 2 (DN 50) and Smaller: 48 inches (1200 mm) with 3/8-inch (10-mm) rod.
  - 2. NPS 2-1/2 to NPS 3-1/2 (DN 65 to DN 90): 48 inches (1200 mm) with 1/2-inch (13-mm) rod.

3. NPS 4 and NPS 5 (DN 100 and DN 125): 48 inches (1200 mm) with 5/8-inch (16-mm) rod.
  4. NPS 6 (DN 150): 48 inches (1200 mm) with 3/4-inch (19-mm) rod.
  5. NPS 8 (DN 200): 48 inches (1200 mm) with 7/8-inch (22-mm) rod.
- L. Install supports for vertical PVC piping every 48 inches (1200 mm).
- M. Install vinyl-coated hangers for PP piping with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 1 (DN 25) and Smaller: 36 inches (900 mm) with 3/8-inch (10-mm) rod.
  2. NPS 1-1/4 to NPS 2 (DN 32 to DN 50): 48 inches (1200 mm) with 3/8-inch (10-mm) rod.
  3. NPS 2-1/2 to NPS 3-1/2 (DN 65 to DN 90): 48 inches (1200 mm) with 1/2-inch (13-mm) rod.
  4. NPS 4 and NPS 5 (DN 100 and DN 125): 48 inches (1200 mm) with 5/8-inch (16-mm) rod.
  5. NPS 6 (DN 150): 48 inches (1200 mm) with 3/4-inch (19-mm) rod.
  6. NPS 8 (DN 200): 48 inches (1200 mm) with 7/8-inch (22-mm) rod.
- N. Install supports for vertical PP piping every 60 inches (1500 mm) for NPS 1 (DN 25) and smaller, and every 72 inches (1800 mm) for NPS 1-1/4 (DN 32) and larger.
- O. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

### 3.7 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.
- C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.
- D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:
1. Domestic Water Booster Pumps: Cold-water suction and discharge piping.
  2. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
  3. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.
  4. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 (DN 65) and larger.

### 3.8 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification materials and installation in Section 220553 "Identification for Plumbing Piping and Equipment."
- B. Label pressure piping with system operating pressure.

### 3.9 FIELD QUALITY CONTROL

#### A. Perform the following tests and inspections:

##### 1. Piping Inspections:

- a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
- b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
  - 1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
  - 2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.
- c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
- d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

##### 2. Piping Tests:

- a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
- b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
- c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
- d. Cap and subject piping to static water pressure of 50 psig (345 kPa) above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
- e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
- f. Prepare reports for tests and for corrective action required.

#### B. Domestic water piping will be considered defective if it does not pass tests and inspections.

#### C. Prepare test and inspection reports.

### 3.10 ADJUSTING

#### A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Open throttling valves to proper setting.
4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
  - a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
  - b. Adjust calibrated balancing valves to flows indicated.
5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.

8. Check plumbing specialties and verify proper settings, adjustments, and operation.

### 3.11 CLEANING

- A. Clean and disinfect potable domestic water piping as follows:
  1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
  2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
    - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
    - b. Fill and isolate system according to either of the following:
      - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm (50 mg/L) of chlorine. Isolate with valves and allow to stand for 24 hours.
      - 2) Fill system or part thereof with water/chlorine solution with at least 200 ppm (200 mg/L) of chlorine. Isolate and allow to stand for three hours.
    - c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
    - d. Repeat procedures if biological examination shows contamination.
    - e. Submit water samples in sterile bottles to authorities having jurisdiction.
- B. Clean non-potable domestic water piping as follows:
  1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
  2. Use purging procedures prescribed by authorities having jurisdiction or; if methods are not prescribed, follow procedures described below:
    - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
    - b. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.
- C. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.
- D. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

### 3.12 PIPING SCHEDULE

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
- B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.
- C. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.
- D. Under-building-slab, domestic water, building-service piping, NPS 3 (DN 80) and smaller, shall be one of the following:
  1. Soft copper tube, ASTM B 88, Type K (ASTM B 88M, Type A); wrought-copper, solder-joint fittings; and brazed joints.
  2. PVC, Schedule 80; socket fittings; and solvent-cemented joints.
  3. PP, SDR 7.4 socket fittings; and fusion-welded joints.

- E. Under-building-slab, domestic water, building-service piping, NPS 4 to NPS 8 (DN 100 to DN 200) and larger, shall be one of the following:
  - 1. Mechanical-joint, ductile-iron pipe; standard- or compact-pattern, mechanical-joint fittings; and mechanical joints.
  - 2. Push-on-joint, ductile-iron pipe; standard- or compact-pattern, push-on-joint fittings; and gasketed joints.
  - 3. Plain-end, ductile-iron pipe; grooved-joint, ductile-iron-pipe appurtenances; and grooved joints.
  - 4. PVC, Schedule 80; socket fittings; and solvent-cemented joints.
  - 5. PP, SDR 11 socket fittings; and fusion-welded joints.
- F. Under-building-slab, domestic water piping, NPS 2 (DN 50) and smaller, shall be one of the following:
  - 1. Soft copper tube, ASTM B 88, Type L (ASTM B 88M, Type B); wrought-copper, solder-joint fittings; and brazed joints.
  - 2. PVC, Schedule 80; socket fittings; and solvent-cemented joints.
  - 3. PP, SDR 7.4 socket fittings; and fusion-welded joints.
- G. Aboveground domestic water piping, NPS 2 (DN 50) and smaller, shall be one of the following:
  - 1. Hard copper tube, ASTM B 88, Type M (ASTM B 88M, Type C); cast- or wrought-copper, solder-joint fittings; and soldered joints.
  - 2. Hard copper tube, ASTM B 88, Type M (ASTM B 88M, Type C); copper pressure-seal-joint fittings; and pressure-sealed joints.
  - 3. Hard copper tube, ASTM B 88, Type M (ASTM B 88M, Type C); copper push-on-joint fittings; and push-on joints.
  - 4. PEX tube, NPS 1 (DN 25) and smaller; fittings for PEX tube; and crimped joints.
- H. Aboveground domestic water piping, NPS 2-1/2 to NPS 4 (DN 65 to DN 100), shall be one of the following:
  - 1. Hard copper tube, ASTM B 88, Type M (ASTM B 88M, Type C); cast- or wrought-copper, solder-joint fittings; and soldered joints.
  - 2. Hard copper tube, ASTM B 88, Type M (ASTM B 88M, Type C); copper pressure-seal-joint fittings; and pressure-sealed joints.
  - 3. Hard copper tube, ASTM B 88, Type M (ASTM B 88M, Type C); grooved-joint, copper-tube appurtenances; and grooved joints.

### 3.13 VALVE SCHEDULE

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
  - 1. Shutoff Duty: Use ball or gate valves for piping NPS 2 (DN 50) and smaller. Use butterfly, ball, or gate valves with flanged ends for piping NPS 2-1/2 (DN 65) and larger.
  - 2. Throttling Duty: Use ball or globe valves for piping NPS 2 (DN 50) and smaller. Use butterfly or ball valves with flanged ends for piping NPS 2-1/2 (DN 65) and larger.
  - 3. Hot-Water Circulation Piping, Balancing Duty: Memory-stop balancing valves.
  - 4. Drain Duty: Hose-end drain valves.
- B. Use check valves to maintain correct direction of domestic water flow to and from equipment.
- C. Iron grooved-end valves may be used with grooved-end piping.

END OF SECTION 221116

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 221116 – DOMESTIC WATER PIPING

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the domestic water piping is installed and is in general conformance with the Contract Documents, applicable Codes, and shop drawings. The domestic water piping has been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

DOMESTIC WATER PIPING INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_

## SECTION 221119 - DOMESTIC WATER PIPING SPECIALTIES

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Vacuum breakers.
  - 2. Backflow preventers.
  - 3. Water pressure-reducing valves.
  - 4. Balancing valves.
  - 5. Temperature-actuated, water mixing valves.
  - 6. Strainers.
  - 7. Outlet boxes.
  - 8. Hose bibbs.
  - 9. Wall hydrants.
  - 10. Post hydrants.
  - 11. Drain valves.
  - 12. Water-hammer arresters.
  - 13. Air vents.
  - 14. Trap-seal primer valves.
  - 15. Flexible connectors.
- B. Related Requirements:
  - 1. Section 220519 "Meters and Gages for Plumbing Piping" for thermometers, pressure gages, and flow meters in domestic water piping.
  - 2. Section 224500 "Emergency Plumbing Fixtures" for water tempering equipment.
  - 3. Section 224716 "Pressure Water Coolers" for water filters for water coolers.

## 1.3 ACTION SUBMITTALS

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

## 1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

## 1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

## PART 2 - PRODUCTS

## 2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

- A. Potable-water piping and components shall comply with NSF 61 Annex G and NSF 14.

## 2.2 PERFORMANCE REQUIREMENTS

- A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig (860 kPa) unless otherwise indicated.

## 2.3 VACUUM BREAKERS

- A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Ames Co.
    - b. Conbraco Industries, Inc.
    - c. FEBCO.
    - d. Watts; a Watts Water Technologies company.
    - e. Zurn Industries, LLC.
  - 2. Standard: ASSE 1001.
  - 3. Size: NPS 1/4 to NPS 3 (DN 8 to DN 80), as required to match connected piping.
  - 4. Body: Bronze.
  - 5. Inlet and Outlet Connections: Threaded.
  - 6. Finish: Rough bronze or Chrome plated.
- B. Hose-Connection Vacuum Breakers:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Arrowhead Brass Products.
    - b. Legend Valve & Fitting, Inc.
    - c. MIFAB, Inc.
    - d. Prier Products, Inc.
    - e. Watts; a Watts Water Technologies company.
    - f. Woodford Manufacturing Company.
    - g. Zurn Industries, LLC.
  - 2. Standard: ASSE 1011.
  - 3. Body: Bronze, nonremovable, with manual drain.
  - 4. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
  - 5. Finish: Chrome or nickel plated.
- C. Pressure Vacuum Breakers:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Ames Co.
    - b. Conbraco Industries, Inc.
    - c. Flomatic Corporation.
    - d. Watts; a Watts Water Technologies company.
    - e. Zurn Industries, LLC.
  - 2. Standard: ASSE 1020.
  - 3. Operation: Continuous-pressure applications.



4. Pressure Loss: 5 psig (35 kPa) maximum, through middle third of flow range.
5. Accessories:
  - a. Valves: Ball type, on inlet and outlet.

D. Spill-Resistant Vacuum Breakers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Watts; a Watts Water Technologies company.
  - b. Zurn Industries, LLC.
2. Standard: ASSE 1056.
3. Operation: Continuous-pressure applications.
4. Accessories:
  - a. Valves: Ball type, on inlet and outlet.

## 2.4 BACKFLOW PREVENTERS

A. Reduced-Pressure-Principle Backflow Preventers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Ames Co.
  - b. Ames Fire & Waterworks.
  - c. Conbraco Industries, Inc.
  - d. Flomatic Corporation.
  - e. Watts; a Watts Water Technologies company.
  - f. Zurn Industries, LLC.
2. Standard: ASSE 1013.
3. Operation: Continuous-pressure applications.
4. Pressure Loss: 12 psig (83 kPa) maximum, through middle third of flow range.
5. Body: Bronze for NPS 2 (DN 50) and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved for NPS 2-1/2 (DN 65) and larger.
6. End Connections: Threaded for NPS 2 (DN 50) and smaller; flanged for NPS 2-1/2 (DN 65) and larger.
7. Configuration: Designed for horizontal, straight-through flow.
8. Accessories:
  - a. Valves NPS 2 (DN 50) and Smaller: Ball type with threaded ends on inlet and outlet.
  - b. Valves NPS 2-1/2 (DN 65) and Larger: Outside-screw and yoke-gate type with flanged ends on inlet and outlet.
  - c. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

B. Double-Check, Backflow-Prevention Assemblies:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Ames Co.
  - b. Ames Fire & Waterworks.
  - c. Conbraco Industries, Inc.
  - d. Watts; a Watts Water Technologies company.
  - e. Zurn Industries, LLC.
2. Standard: ASSE 1015.
3. Operation: Continuous-pressure applications unless otherwise indicated.
4. Pressure Loss: 5 psig (35 kPa) maximum, through middle third of flow range.
5. Body: Bronze for NPS 2 (DN 50) and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved for NPS 2-1/2 (DN 65) and larger.
6. End Connections: Threaded for NPS 2 (DN 50) and smaller; flanged for NPS 2-1/2 (DN 65) and larger.

7. Configuration: Designed for horizontal, straight-through flow.
  8. Accessories:
    - a. Valves NPS 2 (DN 50) and Smaller: Ball type with threaded ends on inlet and outlet.
    - b. Valves NPS 2-1/2 (DN 65) and Larger: Outside-screw and yoke-gate type with flanged ends on inlet and outlet.
- C. Backflow-Preventer Test Kits:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Conbraco Industries, Inc.
    - b. Watts; a Watts Water Technologies company.
    - c. Zurn Industries, LLC.
  2. Description: Factory calibrated, with gages, fittings, hoses, and carrying case with test-procedure instructions.

## 2.5 BALANCING VALVES

- A. Copper-Alloy Calibrated Balancing Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Armstrong International, Inc.
    - b. ITT Corporation.
    - c. NIBCO INC.
    - d. TACO Incorporated.
    - e. Watts; a Watts Water Technologies company.
  2. Type: Ball or Y-pattern globe valve with two readout ports and memory-setting indicator.
  3. Body: Brass or bronze.
  4. Size: Same as connected piping, but not larger than NPS 2 (DN 50).
  5. Accessories: Meter hoses, fittings, valves, differential pressure meter, and carrying case.
- B. Accessories: Meter hoses, fittings, valves, differential pressure meter, and carrying case.
- C. Memory-Stop Balancing Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Conbraco Industries, Inc.
    - b. Crane; Crane Energy Flow Solutions.
    - c. Hammond Valve.
    - d. Jenkins Valves; Crane Energy Flow Solutions.
    - e. Milwaukee Valve Company.
    - f. NIBCO INC.
  2. Standard: MSS SP-110 for two-piece, copper-alloy ball valves.
  3. Pressure Rating: 400-psig (2760-kPa) minimum CWP.
  4. Size: NPS 2 (DN 50) or smaller.
  5. Body: Copper alloy.
  6. Port: Standard or full port.
  7. Ball: Chrome-plated brass.
  8. Seats and Seals: Replaceable.
  9. End Connections: Solder joint or threaded.
  10. Handle: Vinyl-covered steel with memory-setting device.

## 2.6 TEMPERATURE-ACTUATED, WATER MIXING VALVES

## A. Water-Temperature Limiting Devices:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Armstrong International, Inc.
  - b. Leonard Valve Company.
  - c. Powers.
  - d. Symmons Industries, Inc.
  - e. Watts; a Watts Water Technologies company.
  - f. Zurn Industries, LLC.
2. Standard: ASSE 1017.
3. Pressure Rating: 125 psig (860 kPa).
4. Type: Thermostatically controlled, water mixing valve.
5. Material: Bronze body with corrosion-resistant interior components.
6. Connections: Threaded inlets and outlet.
7. Accessories: Check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
8. Valve Finish: Chrome plated.

## B. Primary, Thermostatic, Water Mixing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Armstrong International, Inc.
  - b. Lawler Manufacturing Company, Inc.
  - c. Leonard Valve Company.
  - d. Powers.
  - e. Symmons Industries, Inc.
  - f. Zurn Industries, LLC.
2. Standard: ASSE 1017.
3. Pressure Rating: 125 psig (860 kPa) minimum unless otherwise indicated.
4. Type: Exposed-mounted, thermostatically controlled, water mixing valve.
5. Material: Bronze body with corrosion-resistant interior components.
6. Connections: Threaded inlets and outlet.
7. Accessories: Manual temperature control, check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
8. Valve Finish: Chrome plated.
9. Piping Finish: Copper.

## C. Individual-Fixture, Water Tempering Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Lawler Manufacturing Company, Inc.
  - b. Leonard Valve Company.
  - c. Powers.
  - d. Watts; a Watts Water Technologies company.
  - e. Zurn Industries, LLC.
2. Standard: ASSE 1016, thermostatically controlled, water tempering valve.
3. Pressure Rating: 125 psig (860 kPa) minimum unless otherwise indicated.
4. Body: Bronze body with corrosion-resistant interior components.
5. Temperature Control: Adjustable.
6. Inlets and Outlet: Threaded.
7. Finish: Rough or chrome-plated bronze.

## D. Primary Water Tempering Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Heat-Timer Corporation.
  - b. Holby Valve Inc.
  - c. Uponor.
2. Standard: ASSE 1017, thermostatically controlled, water tempering valve, listed as tempering valve.
3. Pressure Rating: 125 psig (860 kPa) minimum unless otherwise indicated.
4. Body: Bronze.
5. Temperature Control: Manual.
6. Inlets and Outlet: Threaded.
7. Valve Finish: Rough bronze.

## 2.7 STRAINERS FOR DOMESTIC WATER PIPING

## A. Y-Pattern Strainers:

1. Pressure Rating: 125 psig (860 kPa) minimum unless otherwise indicated.
2. Body: Bronze for NPS 2 (DN 50) and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved, epoxy coated and for NPS 2-1/2 (DN 65) and larger.
3. End Connections: Threaded for NPS 2 (DN 50) and smaller; flanged for NPS 2-1/2 (DN 65) and larger.
4. Screen: Stainless steel with round perforations unless otherwise indicated.
5. Perforation Size:
  - a. Strainers NPS 2 (DN 50) and Smaller: 0.033 inch (0.84 mm).
  - b. Strainers NPS 2-1/2 to NPS 4 (DN 65 to DN 100): 0.045 inch (1.14 mm).
6. Drain: Factory-installed, hose-end drain valve.

## 2.8 OUTLET BOXES

## A. Icemaker Outlet Boxes:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Acorn Engineering Company.
  - b. IPS Corporation.
  - c. Oatey.
2. Mounting: Recessed.
3. Material and Finish: Enameled-steel, epoxy-painted-steel, or plastic box and faceplate.
4. Faucet: Valved fitting complying with ASME A112.18.1. Include NPS 1/2 (DN 15) or smaller copper tube outlet.
5. Supply Shutoff Fitting: NPS 1/2 (DN 15) gate, globe, or ball valve and NPS 1/2 (DN 15) copper, water tubing.

## 2.9 HOSE BIBBS

## A. Hose Bibbs:

1. Standard: ASME A112.18.1 for sediment faucets.
2. Body Material: Bronze.
3. Seat: Bronze, replaceable.
4. Supply Connections: NPS 1/2 or NPS 3/4 (DN 15 or DN 20) threaded or solder-joint inlet.

5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
6. Pressure Rating: 125 psig (860 kPa).
7. Vacuum Breaker: Integral nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
8. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
9. Finish for Service Areas: Chrome or nickel plated.
10. Finish for Finished Rooms: Chrome or nickel plated.
11. Operation for Equipment Rooms: Wheel handle or operating key.
12. Operation for Service Areas: Wheel handle.
13. Include operating key with each operating-key hose bibb.
14. Include wall flange with each chrome- or nickel-plated hose bibb.

## 2.10 WALL HYDRANTS

### A. Nonfreeze Wall Hydrants:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Josam Company.
  - b. MIFAB, Inc.
  - c. Smith, Jay R. Mfg. Co.
  - d. Watts; a Watts Water Technologies company.
  - e. Woodford Manufacturing Company.
  - f. Zurn Industries, LLC.
2. Standard: ASME A112.21.3M for exposed-outlet, self-draining wall hydrants.
3. Pressure Rating: 125 psig (860 kPa).
4. Operation: Loose key.
5. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
6. Inlet: NPS 3/4 or NPS 1 (DN 20 or DN 25).
7. Outlet: Exposed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
8. Nozzle and Wall-Plate Finish: Polished nickel bronze.
9. Operating Keys(s): One with each wall hydrant.

### B. Nonfreeze, Hot- and Cold-Water Wall Hydrants:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Prier Products, Inc.
  - b. Smith, Jay R. Mfg. Co.
  - c. Watts; a Watts Water Technologies company.
  - d. Woodford Manufacturing Company.
  - e. Zurn Industries, LLC.
2. Standard: ASME A112.21.3M for exposed-outlet, self-draining wall hydrants.
3. Pressure Rating: 125 psig (860 kPa).
4. Casing and Operating Rods: Of length required to match wall thickness. Include wall clamps.
5. Inlet: NPS 3/4 or NPS 1 (DN 20 or DN 25).
6. Vacuum Breaker:
  - a. Nonremovable, manual-drain-type, hose-connection vacuum breaker complying with ASSE 1011 or backflow preventer complying with ASSE 1052.
  - b. Garden-hose thread complying with ASME B1.20.7 on outlet.

## 2.11 POST HYDRANTS

## A. Freeze-Resistant Sanitary Yard Hydrants:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. Hoepfner Products.
2. Standard: ASSE 1057, Type 5 for nondraining hydrants.
3. Operation: Wheel handle.
4. Head: Copper alloy, with pail hook.
5. Inlet: NPS 3/4-inch (DN 20) threaded inlet and inlet nozzle, galvanized-steel riser, and venturi.
6. Canister: Plastic or Zinc-plated steel with atmospheric-vent device.
7. Vacuum Breaker:
  - a. Removable hose-connection backflow preventer complying with ASSE 1052.
  - b. Garden-hose thread complying with ASME B1.20.7 on outlet for field installation.

## 2.12 DRAIN VALVES

## A. Ball-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: 400-psig (2760-kPa) minimum CWP.
3. Size: NPS 3/4 (DN 20).
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.
6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.
8. Inlet: Threaded or solder joint.
9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

## B. Stop-and-Waste Drain Valves:

1. Standard: MSS SP-110 for ball valves or MSS SP-80 for gate valves.
2. Pressure Rating: 200-psig (1380-kPa) minimum CWP or Class 125.
3. Size: NPS 3/4 (DN 20).
4. Body: Copper alloy or ASTM B 62 bronze.
5. Drain: NPS 1/8 (DN 6) side outlet with cap.

## 2.13 WATER-HAMMER ARRESTERS

## A. Water-Hammer Arresters:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. MIFAB, Inc.
  - b. Precision Plumbing Products.
  - c. Sioux Chief Manufacturing Company, Inc.
  - d. Smith, Jay R. Mfg. Co.
  - e. Watts; a Watts Water Technologies company.
  - f. Zurn Industries, LLC.
2. Standard: ASSE 1010 or PDI-WH 201.
3. Type: Copper tube with piston.
4. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

## 2.14 AIR VENTS

- A. Bolted-Construction Automatic Air Vents:
  - 1. Body: Bronze.
  - 2. Pressure Rating and Temperature: 125-psig (860-kPa) minimum pressure rating at 140 deg F (60 deg C).
  - 3. Float: Replaceable, corrosion-resistant metal.
  - 4. Mechanism and Seat: Stainless steel.
  - 5. Size: NPS 1/2 (DN 15) minimum inlet.
  - 6. Inlet and Vent Outlet End Connections: Threaded.
- B. Welded-Construction Automatic Air Vents:
  - 1. Body: Stainless steel.
  - 2. Pressure Rating: 150-psig (1035-kPa) minimum pressure rating.
  - 3. Float: Replaceable, corrosion-resistant metal.
  - 4. Mechanism and Seat: Stainless steel.
  - 5. Size: NPS 3/8 (DN 10) minimum inlet.
  - 6. Inlet and Vent Outlet End Connections: Threaded.

## 2.15 TRAP-SEAL PRIMER DEVICE

- A. Supply-Type, Trap-Seal Primer Device:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. MIFAB, Inc.
    - b. Precision Plumbing Products.
    - c. Sioux Chief Manufacturing Company, Inc.
    - d. Smith, Jay R. Mfg. Co.
    - e. Watts; a Watts Water Technologies company.
    - f. Zurn Industries, LLC.
  - 2. Standard: ASSE 1018.
  - 3. Pressure Rating: 125 psig (860 kPa) minimum.
  - 4. Body: Bronze.
  - 5. Inlet and Outlet Connections: NPS 1/2 (DN 15) threaded, union, or solder joint.
  - 6. Gravity Drain Outlet Connection: NPS 1/2 (DN 15) threaded or solder joint.
  - 7. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

## 2.16 FLEXIBLE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Flex Pression Ltd.
  - 2. Flexicraft Industries.
  - 3. Flex-Weld, Inc.
  - 4. Hyspan Precision Products, Inc.
  - 5. Mercer Gasket & Shim, Inc.
  - 6. Metraflex Company (The).
  - 7. Universal Metal Hose.

- B. Bronze-Hose Flexible Connectors: Corrugated-bronze tubing with bronze wire-braid covering and ends brazed to inner tubing.
  - 1. Working-Pressure Rating: Minimum 200 psig (1380 kPa).
  - 2. End Connections NPS 2 (DN 50) and Smaller: Threaded copper pipe or plain-end copper tube.
  - 3. End Connections NPS 2-1/2 (DN 65) and Larger: Flanged copper alloy.
- C. Stainless-Steel-Hose Flexible Connectors: Corrugated-stainless-steel tubing with stainless-steel wire-braid covering and ends welded to inner tubing.
  - 1. Working-Pressure Rating: Minimum 200 psig (1380 kPa).
  - 2. End Connections NPS 2 (DN 50) and Smaller: Threaded steel-pipe nipple.
  - 3. End Connections NPS 2-1/2 (DN 65) and Larger: Flanged steel nipple.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.
  - 1. Locate backflow preventers in same room as connected equipment or system.
  - 2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe-to-floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are unacceptable for this application.
  - 3. Do not install bypass piping around backflow preventers.
- B. Install balancing valves in locations where they can easily be adjusted.
- C. Install temperature-actuated, water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.
- D. Install Y-pattern strainers for water on supply side of each water pressure-reducing valve solenoid valve and pump.
- E. Install outlet boxes recessed in wall or surface mounted on wall. Install 2-by-4-inch fire-retardant-treated-wood blocking, wall reinforcement between studs. Comply with requirements for fire-retardant-treated-wood blocking in Section 061000 "Rough Carpentry."
- F. Set freeze-resistant yard hydrants with riser pipe in concrete or pavement. Do not encase canister in concrete.
- G. Install water-hammer arresters in water piping according to PDI-WH 201.
- H. Install air vents at high points of water piping. Install drain piping and discharge onto floor drain.
- I. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.



### 3.2 CONNECTIONS

- A. Comply with requirements for ground equipment in Section 260526 "Grounding and Bonding for Electrical Systems."
- B. Fire-retardant-treated-wood blocking is specified in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for electrical connections.

### 3.3 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
  - 1. Test each pressure vacuum breaker reduced-pressure-principle backflow preventer double-check, backflow-prevention assembly according to authorities having jurisdiction and the device's reference standard.
- B. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

### 3.4 ADJUSTING

- A. Set field-adjustable pressure set points of water pressure-reducing valves.
- B. Set field-adjustable flow set points of balancing valves.
- C. Set field-adjustable temperature set points of temperature-actuated, water mixing valves.

END OF SECTION 221119

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 221119 – DOMESTIC WATER PIPING SPECIALTIES

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the domestic water piping specialties are installed and are in general conformance with the Contract Documents, applicable Codes, and shop drawings. The domestic water piping specialties have been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

DOMESTIC WATER PIPING SPECIALTIES INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_

## SECTION 221123 - DOMESTIC WATER PUMPS

## 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. In-line, sealless centrifugal pumps.
  - 2. Horizontally mounted, in-line, separately coupled centrifugal pumps.
  - 3. Horizontally mounted, in-line, close-coupled centrifugal pumps.
  - 4. Vertically mounted, in-line, close-coupled centrifugal pumps.

## 1.3 DEFINITIONS

- A. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling power-limited circuits.

## 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include materials of construction, rated capacities, certified performance curves with operating points plotted on curves, operating characteristics, electrical characteristics, and furnished specialties and accessories.

## 1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For domestic water pumps to include in operation and maintenance manuals.

## 1.6 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. UL Compliance: Comply with UL 778 for motor-operated water pumps.

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Retain shipping flange protective covers and protective coatings during storage.
- B. Protect bearings and couplings against damage.

- C. Comply with pump manufacturer's written rigging instructions for handling.

## PART 2 - PRODUCTS

### 2.1 IN-LINE, SEALLESS CENTRIFUGAL PUMPS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Bell & Gossett; a Xylem brand.
  - 2. Grundfos Pumps Corp.
  - 3. TACO Incorporated.
- B. Description: Factory-assembled and -tested, in-line, close-coupled, canned-motor, sealless, overhung-impeller centrifugal pumps.
- C. Pump Construction:
  - 1. Pump and Motor Assembly: Hermetically sealed, replaceable-cartridge type with motor and impeller on common shaft and designed for installation with pump and motor shaft horizontal.
  - 2. Casing: Bronze, with threaded or companion-flange connections.
  - 3. Impeller: Plastic.
  - 4. Motor: Single speed, unless otherwise indicated.

### 2.2 HORIZONTALLY MOUNTED, IN-LINE, SEPARATELY COUPLED CENTRIFUGAL PUMPS

- 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. Bell & Gossett; a Xylem brand.
  - 2. TACO Incorporated.
- B. Description: Factory-assembled and -tested, in-line, single-stage, separately coupled, overhung-impeller centrifugal pumps designed for installation with pump and motor shafts mounted horizontal.
- C. Pump Construction:
  - 1. Casing: Radially split with threaded companion-flange connections for pumps with NPS 2 (DN 50) pipe connections and flanged connections for pumps with NPS 2-1/2 (DN 65) pipe connections.
  - 2. Impeller: Statically and dynamically balanced, closed, and keyed to shaft.
  - 3. Shaft and Shaft Sleeve: Steel shaft, with copper-alloy shaft sleeve.
  - 4. Coupling: Flexible.
  - 5. Seal: Mechanical, with carbon-steel rotating ring, stainless-steel spring, ceramic seat, and rubber bellows and gasket.
  - 6. Bearings: Oil-lubricated; bronze-journal or ball type.
  - 7. Shaft Coupling: Flexible, capable of absorbing torsional vibration and shaft misalignment.
- D. Motor: Single speed, with grease-lubricated ball bearings; and resiliently or rigidly mounted to pump casing.

## 2.3 HORIZONTALLY MOUNTED, IN-LINE, CLOSE-COUPLED CENTRIFUGAL PUMPS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Armstrong Pumps, Inc.
  - 2. Bell & Gossett; a Xylem brand.
  - 3. TACO Incorporated.
- B. Description: Factory-assembled and -tested, in-line, single-stage, close-coupled, overhung-impeller centrifugal pumps designed for installation with pump and motor shaft mounted horizontal.
- C. Pump Construction:
  - 1. Casing: Radially split with threaded companion-flange connections for pumps with NPS 2 (DN 50) pipe connections and flanged connections for pumps with NPS 2-1/2 (DN 65) pipe connections.
  - 2. Impeller: Statically and dynamically balanced, closed, and keyed to shaft.
  - 3. Shaft and Shaft Sleeve: Steel shaft with deflector, with copper-alloy shaft sleeve. Include water slinger on shaft between motor and seal.
  - 4. Seal: Mechanical, with carbon-steel rotating ring, stainless-steel spring, ceramic seat, and rubber bellows and gasket.
  - 5. Bearings: Oil-lubricated; bronze-journal or ball type.
  - 6. Shaft Coupling: Flexible, capable of absorbing torsional vibration and shaft misalignment.
- D. Motor: Single speed, with grease-lubricated ball bearings; and resiliently or rigidly mounted to pump casing.

## 2.4 MOTORS

- A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 220513 "Common Motor Requirements for Plumbing Equipment."
  - 1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

## 2.5 CONTROLS

- A. Thermostats: Electric; adjustable for control of hot-water circulation pump.
  - 1. Type: Water-immersion temperature sensor, for installation in piping.
  - 2. Range: 65 to 200 deg F (18 to 93 deg C).
  - 3. Operation of Pump: On or off.
- B. Timers: Electric, for control of hot-water circulation pump.
  - 1. Type: Programmable, seven-day clock with manual override on-off switch.
  - 2. Enclosure: NEMA 250, Type 1, suitable for wall mounting.
  - 3. Operation of Pump: On or off.
  - 4. Transformer: Provide if required.
  - 5. Power Requirement: 120-V ac.
  - 6. Programmable Sequence of Operation: Up to two on-off cycles each day for seven days.

## PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Examine roughing-in of domestic-water-piping system to verify actual locations of connections before pump installation.

## 3.2 PUMP INSTALLATION

- A. Comply with HI 1.4.
- B. Install in-line, sealless centrifugal pumps with shaft horizontal unless otherwise indicated.
- C. Install horizontally mounted, in-line, separately coupled and close-coupled centrifugal pumps with shaft(s) horizontal.
- D. Install vertically mounted, in-line, close-coupled centrifugal pumps with shaft vertical.
- E. Install continuous-thread hanger rods and spring hangers of size required to support pump weight.
  - 1. Comply with requirements for hangers and supports specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
- F. Install thermostats in hot-water return piping.
- G. Install timers per project managers requirements.

## 3.3 CONNECTIONS

- A. Comply with requirements for piping specified in Section 221116 "Domestic Water Piping." Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to pumps to allow service and maintenance.
- C. Connect domestic water piping to pumps. Install suction and discharge piping equal to or greater than size of pump nozzles.
  - 1. Install flexible connectors adjacent to pumps in suction and discharge piping of the following pumps:
    - a. Horizontally mounted, in-line, separately coupled centrifugal pumps.
    - b. Horizontally mounted, in-line, close-coupled centrifugal pumps.
    - c. Vertically mounted, in-line, close-coupled centrifugal pumps.
    - d. Comply with requirements for flexible connectors specified in Section 221116 "Domestic Water Piping."
- D. Install shutoff valve and strainer on suction side of each pump, and check, shutoff, and throttling valves on discharge side of each pump. Install valves same size as connected piping. Comply with requirements for valves specified in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.13 "Butterfly Valves for Plumbing Piping," Section 220523.14 "Check Valves for Plumbing Piping," and Section 220523.15 "Gate Valves for Plumbing Piping," and comply with requirements for strainers specified in Section 221119 "Domestic Water Piping Specialties."
  - 1. Install pressure gage at suction of each pump and pressure gage at discharge of each pump. Install at integral pressure-gage tapings where provided or install pressure-gage

connectors in suction and discharge piping around pumps. Comply with requirements for pressure gages and snubbers specified in Section 220519 "Meters and Gages for Plumbing Piping."

- E. Connect thermostats, and timers to pumps that they control.
- F. Interlock pump between water heater and hot-water storage tank with water heater burner and time-delay relay.

### 3.4 IDENTIFICATION

- A. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment" for identification of pumps.

### 3.5 STARTUP SERVICE

- A. Perform startup service.
  - 1. Complete installation and startup checks according to manufacturer's written instructions.
  - 2. Check piping connections for tightness.
  - 3. Clean strainers on suction piping.
  - 4. Set thermostats, timers, for automatic starting and stopping operation of pumps.
  - 5. Perform the following startup checks for each pump before starting:
    - a. Verify bearing lubrication.
    - b. Verify that pump is free to rotate by hand and that pump for handling hot liquid is free to rotate with pump hot and cold. If pump is bound or drags, do not operate until cause of trouble is determined and corrected.
    - c. Verify that pump is rotating in the correct direction.
  - 6. Prime pump by opening suction valves and closing drains, and prepare pump for operation.
  - 7. Start motor.
  - 8. Open discharge valve slowly.
  - 9. Adjust temperature settings on thermostats.
  - 10. Adjust timer settings.

### 3.6 ADJUSTING

- A. Adjust domestic water pumps to function smoothly, and lubricate as recommended by manufacturer.
- B. Adjust initial temperature set points.
- C. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

END OF SECTION 221123

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 221123 – DOMESTIC WATER PUMPS

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the domestic water pumps are installed and are in general conformance with the Contract Documents, applicable Codes, and shop drawings. The domestic water pumps have been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

DOMESTIC WATER PUMP INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_



## SECTION 221313 - FACILITY SANITARY SEWERS

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Pipe and fittings.
  - 2. Nonpressure and pressure couplings.
  - 3. Expansion joints and deflection fittings.
  - 4. Cleanouts.
  - 5. Encasement for piping.

## 1.3 DEFINITIONS

- A. FRP: Fiberglass-reinforced plastic.

## 1.4 ACTION SUBMITTALS

- A. Product Data: For the following:
  - 1. Expansion joints and deflection fittings.

## 1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Show pipe sizes, locations, and elevations. Show other piping in same trench and clearances from sewer system piping. Indicate interface and spatial relationship between manholes, piping, and proximate structures.
- B. Profile Drawings: Show system piping in elevation. Draw profiles to horizontal scale of not less than 1 inch equals 50 feet (1:500) and to vertical scale of not less than 1 inch equals 5 feet (1:50). Indicate manholes and piping. Show types, sizes, materials, and elevations of other utilities crossing system piping.
- C. Product Certificates: For each type of cast-iron soil pipe and fitting, from manufacturer.
- D. Field quality-control reports.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not store plastic manholes, pipe, and fittings in direct sunlight.
- B. Protect pipe, pipe fittings, and seals from dirt and damage.

## FACILITY SANITARY SEWERS

- C. Handle manholes according to manufacturer's written rigging instructions.

## 1.7 PROJECT CONDITIONS

- A. Interruption of Existing Sanitary Sewerage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
  - 1. Notify Construction Manager no fewer than two days in advance of proposed interruption of service.
  - 2. Do not proceed with interruption of service without Construction Manager's written permission.

## PART 2 - PRODUCTS

### 2.1 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 74, Service and Extra-Heavy classes.
- B. Gaskets: ASTM C 564, rubber.
- C. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

### 2.2 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 888 or CISPI 301.
- B. CISPI-Trademark, Shielded Couplings:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. ANACO-Husky.
    - b. Fernco Inc.
    - c. Tyler Pipe; a subsidiary of McWane Inc.
  - 2. Description: ASTM C 1277 and CISPI 310, with stainless-steel corrugated shield; stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.
- C. Heavy-Duty, Shielded Couplings:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. ANACO-Husky.
    - b. Clamp-All Corp.
    - c. Mission Rubber Company, LLC; a division of MCP Industries.
    - d. Tyler Pipe; a subsidiary of McWane Inc.
  - 2. Description: ASTM C 1277 and ASTM C 1540, with stainless-steel shield; stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.
- D. Cast-Iron, Shielded Couplings:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. MG Piping Products Company.

2. Description: ASTM C 1277 with ASTM A 48/A 48M, two-piece, cast-iron housing; stainless-steel bolts and nuts; and ASTM C 564, rubber sleeve with integral, center pipe stop.

E. Unshielded Couplings:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - a. ANACO-Husky.
2. Description: ASTM C 1277 and ASTM C 1461, rigid, sleeve-type, reducing- or transition-type mechanical coupling, with integral, center pipe stop, molded from ASTM C 1440, TPE material; with corrosion-resistant-metal tension band and tightening mechanism on each end.

### 2.3 DUCTILE-IRON, GRAVITY SEWER PIPE AND FITTINGS

- A. Pipe: ASTM A 746, for push-on joints.
- B. Standard Fittings: AWWA C110, ductile or gray iron, for push-on joints.
- C. Compact Fittings: AWWA C153, ductile iron, for push-on joints.
- D. Gaskets: AWWA C111, rubber.

### 2.4 DUCTILE-IRON, PRESSURE PIPE AND FITTINGS

- A. Push-on-Joint Piping:
  1. Pipe: AWWA C151.
  2. Standard Fittings: AWWA C110, ductile or gray iron.
  3. Compact Fittings: AWWA C153.
  4. Gaskets: AWWA C111, rubber, of shape matching pipe and fittings.
- B. Mechanical-Joint Piping:
  1. Pipe: AWWA C151, with bolt holes in bell.
  2. Standard Fittings: AWWA C110, ductile or gray iron, with bolt holes in bell.
  3. Compact Fittings: AWWA C153, with bolt holes in bells.
  4. Glands: Cast or ductile iron; with bolt holes and high-strength, cast-iron or high-strength, low-alloy steel bolts and nuts.
  5. Gaskets: AWWA C111, rubber, of shape matching pipe, fittings, and glands.

### 2.5 ABS PIPE AND FITTINGS

- A. ABS Sewer Pipe and Fittings: ASTM D 2751, with bell-and-spigot ends for gasketed joints.
  1. NPS 3 to NPS 6 (DN 80 to DN 150): SDR 35.
  2. NPS 8 to NPS 12 (DN 200 to DN 300): SDR 42.
- B. Gaskets: ASTM F 477, elastomeric seals.

### 2.6 PVC PIPE AND FITTINGS

- A. PVC Profile Sewer Piping:

1. Pipe: ASTM F 794, PVC profile, gravity sewer pipe with bell-and-spigot ends for gasketed joints.
  2. Fittings: ASTM D 3034, PVC with bell ends.
  3. Gaskets: ASTM F 477, elastomeric seals.
- B. PVC Type PSM Sewer Piping:
1. Pipe: ASTM D 3034, SDR 35, PVC Type PSM sewer pipe with bell-and-spigot ends for gasketed joints.
  2. Fittings: ASTM D 3034, PVC with bell ends.
  3. Gaskets: ASTM F 477, elastomeric seals.
- C. PVC Gravity Sewer Piping:
1. Pipe and Fittings: ASTM F 679, T-1 wall thickness, PVC gravity sewer pipe with bell-and-spigot ends and with integral ASTM F 477, elastomeric seals for gasketed joints.
- D. PVC Pressure Piping:
1. Pipe: AWWA C900, Class 150 and Class 200 PVC pipe with bell-and-spigot ends for gasketed joints.
  2. Fittings: AWWA C900, Class 150 and Class 200 PVC pipe with bell ends.
  3. Gaskets: ASTM F 477, elastomeric seals.
- E. PVC Water-Service Piping:
1. Pipe: ASTM D 1785, Schedule 40 and Schedule 80 PVC, with plain ends for solvent-cemented joints.
  2. Fittings: ASTM D 2466, Schedule 40 and ASTM D 2467, Schedule 80 PVC, socket type.

## 2.7 NONPRESSURE-TYPE TRANSITION COUPLINGS

- A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined and corrosion-resistant-metal tension band and tightening mechanism on each end.
- B. Sleeve Materials:
1. For Cast-Iron Soil Pipes: ASTM C 564, rubber.
  2. For Concrete Pipes: ASTM C 443 (ASTM C 443M), rubber.
  3. For Fiberglass Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
  4. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
  5. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.
- C. Unshielded, Flexible Couplings:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Dallas Specialty & Mfg. Co.
    - b. Fernco Inc.
    - c. Mission Rubber Company, LLC; a division of MCP Industries.
    - d. NDS Inc.
    - e. Plastic Oddities.
  2. Description: Elastomeric sleeve with corrosion-resistant-metal tension band and tightening mechanism on each end.
- D. Shielded, Flexible Couplings:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Cascade Waterworks Mfg. Co.
    - b. Dallas Specialty & Mfg. Co.
    - c. Mission Rubber Company, LLC; a division of MCP Industries.
  - 2. Description: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
- E. Ring-Type, Flexible Couplings:
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Fernco Inc.
    - b. Mission Rubber Company, LLC; a division of MCP Industries.
  - 2. Description: Elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring.
- F. Nonpressure-Type, Rigid Couplings:
- 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. ANACO-Husky.
  - 2. Description: ASTM C 1461, sleeve-type, reducing- or transition-type mechanical coupling, molded from ASTM C 1440, TPE material; with corrosion-resistant-metal tension band and tightening mechanism on each end.

## 2.8 PRESSURE-TYPE PIPE COUPLINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- 1. Cascade Waterworks Mfg. Co.
  - 2. Dresser, Inc.
  - 3. Smith, Jay R. Mfg. Co.
  - 4. Victaulic Company.
  - 5. Viking Johnson.
- B. Tubular-Sleeve Couplings: AWWA C219, with center sleeve, gaskets, end rings, and bolt fasteners.
- C. Metal, bolted, sleeve-type, reducing or transition coupling, for joining underground pressure piping. Include 150-psig (1035-kPa) minimum pressure rating and ends of same sizes as piping to be joined.
- D. Center-Sleeve Material: Manufacturer's standard.
- E. Gasket Material: Natural or synthetic rubber.
- F. Metal Component Finish: Corrosion-resistant coating or material.

## 2.9 EXPANSION JOINTS AND DEFLECTION FITTINGS

- A. Ductile-Iron, Flexible Expansion Joints:
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. EBAA Iron, Inc.
    - b. Romac Industries, Inc.

- c. Star Pipe Products.
  - 2. Description: Compound fitting with combination of flanged and mechanical-joint ends complying with AWWA C110 or AWWA C153. Include two gasketed ball-joint sections and one or more gasketed sleeve sections, rated for 250-psig (1725-kPa) minimum working pressure and for offset and expansion indicated.
- B. Ductile-Iron Expansion Joints:
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Dresser, Inc.
    - b. EBAA Iron, Inc.
    - c. JCM Industries, Inc.
    - d. Smith, Jay R. Mfg. Co.
  - 2. Description: Three-piece assembly of telescoping sleeve with gaskets and restrained-type, ductile-iron, bell-and-spigot end sections complying with AWWA C110 or AWWA C153. Include rating for 250-psig (1725-kPa) minimum working pressure and for expansion indicated.
- C. Ductile-Iron Deflection Fittings:
- 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. EBAA Iron, Inc.
  - 2. Description: Compound coupling fitting with ball joint, flexing section, gaskets, and restrained-joint ends complying with AWWA C110 or AWWA C153. Include rating for 250-psig (1725-kPa) minimum working pressure and for up to 15 degrees of deflection.

## 2.10 CLEANOUTS

- A. Cast-Iron Cleanouts:
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. MIFAB, Inc.
    - b. Smith, Jay R. Mfg. Co.
    - c. Zurn Industries, LLC.
  - 2. Description: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.
  - 3. Top-Loading Classification(s): Medium Duty and Heavy Duty.
  - 4. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, Service class, cast-iron soil pipe and fittings.

## 2.11 ENCASEMENT FOR PIPING

- A. Standard: ASTM A 674 or AWWA C105.
- B. Material: Linear low-density polyethylene film of 0.008-inch (0.20-mm) or high-density, cross-laminated polyethylene film of 0.004-inch (0.10-mm) minimum thickness.
- C. Form: Sheet or tube.
- D. Color: Black or natural.

## 2.12 CONCRETE

- A. General: Cast-in-place concrete complying with ACI 318, ACI 350/350R (ACI 350M/350RM), and the following:
  - 1. Cement: ASTM C 150, Type II.
  - 2. Fine Aggregate: ASTM C 33, sand.
  - 3. Coarse Aggregate: ASTM C 33, crushed gravel.
  - 4. Water: Potable.
- B. Portland Cement Design Mix: 4000 psi (27.6 MPa) minimum, with 0.45 maximum water/cementitious materials ratio.
  - 1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
  - 2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.
- C. Ballast and Pipe Supports: Portland cement design mix, 3000 psi (20.7 MPa) minimum, with 0.58 maximum water/cementitious materials ratio.
  - 1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
  - 2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

## PART 3 - EXECUTION

### 3.1 EARTHWORK

- A. Excavating, trenching, and backfilling are specified in Section 310020 "Earthwork."

### 3.2 PIPING INSTALLATION

- A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground sanitary sewer piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.
- B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements.
- C. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.
- D. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling.
- E. Install gravity-flow, nonpressure, drainage piping according to the following:
  - 1. Install piping pitched down in direction of flow, at minimum slope of 1 percent unless otherwise indicated.
  - 2. Install piping NPS 6 (DN 150) and larger with restrained joints at tee fittings and at changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place-concrete supports or anchors.
  - 3. Install hub-and-spigot, cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook."

4. Install hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook."
  5. Install ductile-iron, gravity sewer piping according to ASTM A 746.
  6. Install ABS sewer piping according to ASTM D 2321 and ASTM F 1668.
  7. Install PVC profile sewer piping according to ASTM D 2321 and ASTM F 1668.
  8. Install PVC Type PSM sewer piping according to ASTM D 2321 and ASTM F 1668.
  9. Install PVC gravity sewer piping according to ASTM D 2321 and ASTM F 1668.
- F. Install corrosion-protection piping encasement over the following underground metal piping according to ASTM A 674 or AWWA C105:
1. Hub-and-spigot, cast-iron soil pipe.
  2. Hubless cast-iron soil pipe and fittings.
  3. Ductile-iron pipe and fittings.
  4. Expansion joints and deflection fittings.
- G. Clear interior of piping of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed. Place plug in end of incomplete piping at end of day and when work stops.

### 3.3 PIPE JOINT CONSTRUCTION

- A. Join gravity-flow, nonpressure, drainage piping according to the following:
1. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
  2. Join hub-and-spigot, cast-iron soil piping with calked joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead and oakum calked joints.
  3. Join hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.
  4. Join ductile-iron, gravity sewer piping according to AWWA C600 for push-on joints.
  5. Join ABS sewer piping according to ASTM D 2321 and ASTM D 2751 for elastomeric-seal joints.
  6. Join PVC corrugated sewer piping according to ASTM D 2321.
  7. Join PVC profile sewer piping according to ASTM D 2321 for elastomeric-seal joints or ASTM F 794 for gasketed joints.
  8. Join PVC Type PSM sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasket joints.
  9. Join PVC gravity sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasket joints.
  10. Join dissimilar pipe materials with nonpressure-type, flexible or rigid couplings.
- B. Pipe couplings, expansion joints, and deflection fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
1. Use nonpressure flexible couplings where required to join gravity-flow, nonpressure sewer piping unless otherwise indicated.
    - a. Unshielded flexible or rigid couplings for pipes of same or slightly different OD.
    - b. Unshielded, increaser/reducer-pattern, flexible or rigid couplings for pipes with different OD.
    - c. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.

### 3.4 CONCRETE PLACEMENT

- A. Place cast-in-place concrete according to ACI 318.



### 3.5 CLEANOUT INSTALLATION

- A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts, and use cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.
  - 1. Medium-Duty, top-loading classification cleanouts in paved foot-traffic areas.
  - 2. Use Heavy-Duty, top-loading classification cleanouts in vehicle-traffic service areas.
- B. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

### 3.6 CONNECTIONS

- A. Connect non-pressure, gravity-flow drainage piping to building's sanitary building drains specified in Section 221316 "Sanitary Waste and Vent Piping."
- B. Connect force-main piping to building's sanitary force mains specified in Section 221316 "Sanitary Waste and Vent Piping." Terminate piping where indicated.
- C. Make connections to existing piping and underground manholes.
  - 1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye fitting plus 6-inch (150-mm) overlap with not less than 6 inches (150 mm) of concrete with 28-day compressive strength of 3000 psi (20.7 MPa).
  - 2. Make branch connections from side into existing piping, NPS 4 to NPS 20 (DN 100 to DN 500). Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than 6 inches (150 mm) of concrete with 28-day compressive strength of 3000 psi (20.7 MPa).
  - 3. Make branch connections from side into existing piping, NPS 21 (DN 525) or larger, or to underground manholes by cutting opening into existing unit large enough to allow 3 inches (76 mm) of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On outside of pipe or manhole wall, encase entering connection in 6 inches (150 mm) of concrete for minimum length of 12 inches (300 mm) to provide additional support of collar from connection to undisturbed ground.
    - a. Use concrete that will attain a minimum 28-day compressive strength of 3000 psi (20.7 MPa) unless otherwise indicated.
    - b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.
  - 4. Protect existing piping and manholes to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

### 3.7 IDENTIFICATION

- A. Comply with requirements in Section 310020 "Earthwork" for underground utility identification devices. Arrange for installation of green warning tapes directly over piping and at outside edges of underground manholes.
  - 1. Use warning tape or detectable warning tape over ferrous piping.
  - 2. Use detectable warning tape over nonferrous piping and over edges of underground manholes.

### 3.8 FIELD QUALITY CONTROL

- A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches (600 mm) of backfill is in place, and again at completion of Project.
  - 1. Submit separate report for each system inspection.
  - 2. Defects requiring correction include the following:
    - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
    - b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
    - c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
    - d. Infiltration: Water leakage into piping.
    - e. Exfiltration: Water leakage from or around piping.
  - 3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
  - 4. Reinspect and repeat procedure until results are satisfactory.
- B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
  - 1. Do not enclose, cover, or put into service before inspection and approval.
  - 2. Test completed piping systems according to requirements of authorities having jurisdiction.
  - 3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
  - 4. Submit separate report for each test.
  - 5. Hydrostatic Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction and the following:
    - a. Fill sewer piping with water. Test with pressure of at least 10-foot (3-m) head of water, and maintain such pressure without leakage for at least 15 minutes.
    - b. Close openings in system and fill with water.
    - c. Purge air and refill with water.
    - d. Disconnect water supply.
    - e. Test and inspect joints for leaks.
  - 6. Air Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction, UNI-B-6, and the following:
    - a. Option: Test plastic gravity sewer piping according to ASTM F 1417.
    - b. Option: Test concrete gravity sewer piping according to ASTM C 924 (ASTM C 924M).
- C. Leaks and loss in test pressure constitute defects that must be repaired.
- D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

### 3.9 CLEANING

- A. Clean dirt and superfluous material from interior of piping.

END OF SECTION 221313

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 221313 – FACILITY SANITARY SEWERS

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the facility sanitary sewers are installed and are in general conformance with the Contract Documents, applicable Codes, and shop drawings. The facility sanitary sewers have been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

FACILITY SANITARY SEWER INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_



## SECTION 221316 - SANITARY WASTE AND VENT PIPING

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Pipe, tube, and fittings.
  - 2. Specialty pipe fittings.
  - 3. Encasement for underground metal piping.
- B. Related Sections:
  - 1. Section 221313 "Facility Sanitary Sewers" for sanitary sewerage piping and structures outside the building.

## 1.3 PERFORMANCE REQUIREMENTS

- A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:
  - 1. Soil, Waste, and Vent Piping: 10-foot head of water (30 kPa).
- B. Seismic Performance: Soil, waste, and vent piping and support and installation shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

## 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For sovent drainage system. Include plans, elevations, sections, and details.

## 1.5 INFORMATIONAL SUBMITTALS

- A. Seismic Qualification Certificates: For waste and vent piping, accessories, and components, from manufacturer.
  - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
  - 2. Detailed description of piping anchorage devices on which the certification is based and their installation requirements.
- B. Field quality-control reports.

## 1.6 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF/ANSI 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.

## 1.7 PROJECT CONDITIONS

- A. Interruption of Existing Sanitary Waste Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
  - 1. Notify Construction Manager no fewer than two days in advance of proposed interruption of sanitary waste service.
  - 2. Do not proceed with interruption of sanitary waste service without Construction Manager's written permission.

## PART 2 - PRODUCTS

### 2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

### 2.2 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 74, Service and Extra Heavy class(es).
- B. Gaskets: ASTM C 564, rubber.
- C. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

### 2.3 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 888 or CISPI 301.
- B. Sovent Stack Fittings: ASME B16.45 or ASSE 1043, hubless, cast-iron aerator and deaerator drainage fittings.
- C. CISPI, Hubless-Piping Couplings:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Fernco Inc.
    - b. MIFAB, Inc.
    - c. Tyler Pipe; a subsidiary of McWane Inc.
  - 2. Standards: ASTM C 1277 and CISPI 310.
  - 3. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

- D. Heavy-Duty, Hubless-Piping Couplings:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. ANACO-Husky.
    - b. MIFAB, Inc.
    - c. Tyler Pipe; a subsidiary of McWane Inc.
  - 2. Standards: ASTM C 1277 and ASTM C 1540.
  - 3. Description: Stainless-steel shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.
- E. Cast-Iron, Hubless-Piping Couplings:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. MG Piping Products Company.
  - 2. Standard: ASTM C 1277.
  - 3. Description: Two-piece ASTM A 48/A 48M, cast-iron housing; stainless-steel bolts and nuts; and ASTM C 564, rubber sleeve with integral, center pipe stop.

## 2.4 COPPER TUBE AND FITTINGS

- A. Copper DWV Tube: ASTM B 306, drainage tube, drawn temper.
- B. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.
- C. Hard Copper Tube: ASTM B 88, Type L and Type M (ASTM B 88M, Type B and Type C), water tube, drawn temper.
- D. Soft Copper Tube: ASTM B 88, Type L (ASTM B 88M, Type B), water tube, annealed temper.
- E. Copper Pressure Fittings:
  - 1. Copper Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
  - 2. Copper Unions: MSS SP-123, copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.
- F. Copper Flanges: ASME B16.24, Class 150, cast copper with solder-joint end.
  - 1. Flange Gasket Materials: ASME B16.21, full-face, flat, nonmetallic, asbestos-free, 1/8-inch (3.2-mm) maximum thickness unless thickness or specific material is indicated.
  - 2. Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.
- G. Solder: ASTM B 32, lead free with ASTM B 813, water-flushable flux.

## 2.5 ABS PIPE AND FITTINGS

- A. Solid-Wall ABS Pipe: ASTM D 2661, Schedule 40.
- B. ABS Socket Fittings: ASTM D 2661, made to ASTM D 3311, drain, waste, and vent patterns.
- C. Solvent Cement: ASTM D 2235.
  - 1. ABS solvent cement shall have a VOC content of 325 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2. Solvent cement shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

## 2.6 PVC PIPE AND FITTINGS

- A. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.
- B. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.
- C. Adhesive Primer: ASTM F 656.
  1. Adhesive primer shall have a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  2. Adhesive primer shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- D. Solvent Cement: ASTM D 2564.
  1. PVC solvent cement shall have a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  2. Solvent cement shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

## 2.7 SPECIALTY PIPE FITTINGS

- A. Transition Couplings:
  1. General Requirements: Fitting or device for joining piping with small differences in OD's or of different materials. Include end connections same size as and compatible with pipes to be joined.
  2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
  3. Unshielded, Nonpressure Transition Couplings:
    - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) Dallas Specialty & Mfg. Co.
      - 2) Fernco Inc.
      - 3) Mission Rubber Company, LLC; a division of MCP Industries.
    - b. Standard: ASTM C 1173.
    - c. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
    - d. Sleeve Materials:
      - 1) For Cast-Iron Soil Pipes: ASTM C 564, rubber.
      - 2) For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
      - 3) For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.
  4. Shielded, Nonpressure Transition Couplings:
    - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) Cascade Waterworks Mfg. Co.
      - 2) Mission Rubber Company, LLC; a division of MCP Industries.



- b. Standard: ASTM C 1460.
  - c. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
- 5. Pressure Transition Couplings:
  - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - 1) Cascade Waterworks Mfg. Co.
    - 2) Dresser, Inc.
    - 3) Romac Industries, Inc.
    - 4) Smith, Jay R. Mfg. Co.
    - 5) Viking Johnson.
  - b. Standard: AWWA C219.
  - c. Description: Metal, sleeve-type same size as, with pressure rating at least equal to, and ends compatible with, pipes to be joined.
  - d. Center-Sleeve Material: Manufacturer's standard.
  - e. Gasket Material: Natural or synthetic rubber.
  - f. Metal Component Finish: Corrosion-resistant coating or material.
- B. Dielectric Fittings:
  - 1. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
  - 2. Dielectric Unions:
    - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) Capitol Manufacturing Company.
      - 2) Watts; a Watts Water Technologies company.
      - 3) Wilkins.
      - 4) Zurn Industries, LLC.
    - b. Description:
      - 1) Standard: ASSE 1079.
      - 2) Pressure Rating: 125 psig (860 kPa) minimum at 180 deg F (82 deg C)
      - 3) End Connections: Solder-joint copper alloy and threaded ferrous.
  - 3. Dielectric Flanges:
    - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) Capitol Manufacturing Company.
      - 2) Central Plastics Company.
      - 3) Watts; a Watts Water Technologies company.
      - 4) Wilkins.
      - 5) Zurn Industries, LLC.
    - b. Description:
      - 1) Standard: ASSE 1079.
      - 2) Factory-fabricated, bolted, companion-flange assembly.
      - 3) Pressure Rating: 125 psig (860 kPa) minimum at 180 deg F (82 deg C).
      - 4) End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.
  - 4. Dielectric-Flange Insulating Kits:
    - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) Advance Products & Systems, Inc.
      - 2) Central Plastics Company.
      - 3) Pipeline Seal and Insulator, Inc.

- b. Description:
  - 1) Nonconducting materials for field assembly of companion flanges.
  - 2) Pressure Rating: 150 psig (1035 kPa).
  - 3) Gasket: Neoprene or phenolic.
  - 4) Bolt Sleeves: Phenolic or polyethylene.
  - 5) Washers: Phenolic with steel backing washers.
- 5. Dielectric Nipples:
  - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - 1) Elster Perfection Corporation.
    - 2) Grinnell Mechanical Products.
    - 3) Precision Plumbing Products.
    - 4) Victaulic Company.
  - b. Description:
    - 1) Standard: IAPMO PS 66
    - 2) Electroplated steel nipple.
    - 3) Pressure Rating: 300 psig (2070 kPa) at 225 deg F (107 deg C).
    - 4) End Connections: Male threaded or grooved.
    - 5) Lining: Inert and noncorrosive, propylene.

## 2.8 ENCASEMENT FOR UNDERGROUND METAL PIPING

- A. Standard: ASTM A 674 or AWWA C105/A 21.5.
- B. Material: Linear low-density polyethylene film of 0.008-inch (0.20-mm) or high-density, cross-laminated polyethylene film of 0.004-inch (0.10-mm) minimum thickness.
- C. Form: Sheet or tube.
- D. Color: Black or natural.

## PART 3 - EXECUTION

### 3.1 EARTH MOVING

- A. Comply with requirements for excavating, trenching, and backfilling specified in Section 310200 "Earthwork."

### 3.2 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping to permit valve servicing.
- F. Install piping at indicated slopes.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Install piping to allow application of insulation.
- J. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- K. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- L. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.
- M. Install soil and waste drainage and vent piping at the following minimum slopes unless otherwise indicated:
  - 1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 (DN 80) and smaller; 1 percent downward in direction of flow for piping NPS 4 (DN 100) and larger.
  - 2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
  - 3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.
- N. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
  - 1. Install encasement on underground piping according to ASTM A 674 or AWWA C105/A 21.5.
- O. Install steel piping according to applicable plumbing code.
- P. Install aboveground copper tubing according to CDA's "Copper Tube Handbook."
- Q. Install aboveground ABS piping according to ASTM D 2661.
- R. Install aboveground PVC piping according to ASTM D 2665.
- S. Install underground ABS and PVC piping according to ASTM D 2321.
- T. Install engineered soil and waste drainage and vent piping systems as follows:

1. Combination Waste and Vent: Comply with standards of authorities having jurisdiction.
  2. Solvent Drainage System: Comply with ASSE 1043 and solvent fitting manufacturer's written installation instructions.
  3. Reduced-Size Venting: Comply with standards of authorities having jurisdiction.
- U. Plumbing Specialties:
1. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary drainage gravity-flow piping. Install cleanout fitting with closure plug inside the building in sanitary drainage force-main piping. Comply with requirements for cleanouts specified in Section 221319 "Sanitary Waste Piping Specialties."
  2. Install drains in sanitary drainage gravity-flow piping. Comply with requirements for drains specified in Section 221319 "Sanitary Waste Piping Specialties."
- V. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
- W. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- X. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- Y. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

### 3.3 JOINT CONSTRUCTION

- A. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
- B. Join hub-and-spigot, cast-iron soil piping with calked joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead-and-oakum calked joints.
- C. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.
- D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
  2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- E. Join copper tube and fittings with soldered joints according to ASTM B 828. Use ASTM B 813, water-flushable, lead-free flux and ASTM B 32, lead-free-alloy solder.
- F. Grooved Joints: Cut groove ends of pipe according to AWWA C606. Lubricate and install gasket over ends of pipes or pipe and fitting. Install coupling housing sections, over gasket, with keys seated in piping grooves. Install and tighten housing bolts.

- G. Flanged Joints: Align bolt holes. Select appropriate gasket material, size, type, and thickness. Install gasket concentrically positioned. Use suitable lubricants on bolt threads. Torque bolts in cross pattern.
- H. Plastic, Nonpressure-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
  - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
  - 2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 Appendixes.
  - 3. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 Appendixes.

### 3.4 SPECIALTY PIPE FITTING INSTALLATION

- A. Transition Couplings:
  - 1. Install transition couplings at joints of piping with small differences in OD's.
  - 2. In Drainage Piping: Unshielded, nonpressure transition couplings.
  - 3. In Aboveground Force Main Piping: Fitting-type transition couplings.
  - 4. In Underground Force Main Piping:
    - a. NPS 1-1/2 (DN 40) and Smaller: Fitting-type transition couplings.
    - b. NPS 2 (DN 50) and Larger: Pressure transition couplings.
- B. Dielectric Fittings:
  - 1. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
  - 2. Dielectric Fittings for NPS 2 (DN 50) and Smaller: Use dielectric unions.
  - 3. Dielectric Fittings for NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Use dielectric flanges.
  - 4. Dielectric Fittings for NPS 5 (DN 125) and Larger: Use dielectric flange kits.

### 3.5 VALVE INSTALLATION

- A. General valve installation requirements are specified in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.13 "Butterfly Valves for Plumbing Piping," Section 220523.14 "Check Valves for Plumbing Piping," and Section 220523.15 "Gate Valves for Plumbing Piping."
- B. Shutoff Valves:
  - 1. Install shutoff valve on each sewage pump discharge.
  - 2. Install gate or full-port ball valve for piping NPS 2 (DN 50) and smaller.
  - 3. Install gate valve for piping NPS 2-1/2 (DN 65) and larger.
- C. Check Valves: Install swing check valve, between pump and shutoff valve, on each sewage pump discharge.

### 3.6 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- B. Comply with requirements for pipe hanger and support devices and installation specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
  - 1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
  - 2. Install stainless-steel pipe hangers for horizontal piping in corrosive environments.
  - 3. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
  - 4. Install stainless-steel pipe support clamps for vertical piping in corrosive environments.
  - 5. Vertical Piping: MSS Type 8 or Type 42, clamps.

6. Install individual, straight, horizontal piping runs:
    - a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
    - b. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.
    - c. Longer Than 100 Feet (30 m) if Indicated: MSS Type 49, spring cushion rolls.
  7. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
  8. Base of Vertical Piping: MSS Type 52, spring hangers.
- C. Support horizontal piping and tubing within 12 inches (300 mm) of each fitting, valve, and coupling.
- D. Support vertical piping and tubing at base and at each floor.
- E. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch (10-mm) minimum rods.
- F. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 60 inches (1500 mm) with 3/8-inch (10-mm) rod.
  2. NPS 3 (DN 80): 60 inches (1500 mm) with 1/2-inch (13-mm) rod.
  3. NPS 4 and NPS 5 (DN 100 and DN 125): 60 inches (1500 mm) with 5/8-inch (16-mm) rod.
  4. NPS 6 and NPS 8 (DN 150 and DN 200): 60 inches (1500 mm) with 3/4-inch (19-mm) rod.
  5. NPS 10 and NPS 12 (DN 250 and DN 300): 60 inches (1500 mm) with 7/8-inch (22-mm) rod.
  6. Spacing for 10-foot (3-m) lengths may be increased to 10 feet (3 m). Spacing for fittings is limited to 60 inches (1500 mm).
- G. Install supports for vertical cast-iron soil piping every 15 feet (4.5 m).
- H. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 1-1/4 (DN 32): 84 inches (2100 mm) with 3/8-inch (10-mm) rod.
  2. NPS 1-1/2 (DN 40): 108 inches (2700 mm) with 3/8-inch (10-mm) rod.
  3. NPS 2 (DN 50): 10 feet (3 m) with 3/8-inch (10-mm) rod.
  4. NPS 2-1/2 (DN 65): 11 feet (3.4 m) with 1/2-inch (13-mm) rod.
  5. NPS 3 (DN 80): 12 feet (3.7 m) with 1/2-inch (13-mm) rod.
  6. NPS 4 and NPS 5 (DN 100 and DN 125): 12 feet (3.7 m) with 5/8-inch (16-mm) rod.
  7. NPS 6 and NPS 8 (DN 150 and DN 200): 12 feet (3.7 m) with 3/4-inch (19-mm) rod.
  8. NPS 10 and NPS 12 (DN 250 and DN 300): 12 feet (3.7 m) with 7/8-inch (22-mm) rod.
- I. Install supports for vertical steel piping every 15 feet (4.5 m).
- J. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 1-1/4 (DN 32): 72 inches (1800 mm) with 3/8-inch (10-mm) rod.
  2. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 96 inches (2400 mm) with 3/8-inch (10-mm) rod.
  3. NPS 2-1/2 (DN 65): 108 inches (2700 mm) with 1/2-inch (13-mm) rod.
  4. NPS 3 and NPS 5 (DN 80 and DN 125): 10 feet (3 m) with 1/2-inch (13-mm) rod.
  5. NPS 6 (DN 150): 10 feet (3 m) with 5/8-inch (16-mm) rod.
  6. NPS 8 (DN 200): 10 feet (3 m) with 3/4-inch (19-mm) rod.

- K. Install supports for vertical copper tubing every 10 feet (3 m).
- L. Install hangers for ABS and PVC piping with the following maximum horizontal spacing and minimum rod diameters:
  - 1. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 48 inches (1200 mm) with 3/8-inch (10-mm) rod.
  - 2. NPS 3 (DN 80): 48 inches (1200 mm) with 1/2-inch (13-mm) rod.
  - 3. NPS 4 and NPS 5 (DN 100 and DN 125): 48 inches (1200 mm) with 5/8-inch (16-mm) rod.
  - 4. NPS 6 and NPS 8 (DN 150 and DN 200): 48 inches (1200 mm) with 3/4-inch (19-mm) rod.
  - 5. NPS 10 and NPS 12 (DN 250 and DN 300): 48 inches (1200 mm) with 7/8-inch (22-mm) rod.
- M. Install supports for vertical ABS and PVC piping every 48 inches (1200 mm).
- N. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

### 3.7 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect drainage and vent piping to the following:
  - 1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
  - 2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
  - 3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
  - 4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
  - 5. Comply with requirements for cleanouts and drains specified in Section 221319 "Sanitary Waste Piping Specialties."
  - 6. Equipment: Connect drainage piping as indicated. Provide shutoff valve if indicated and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 (DN 65) and larger.
- D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.
- E. Make connections according to the following unless otherwise indicated:
  - 1. Install unions, in piping NPS 2 (DN 50) and smaller, adjacent to each valve and at final connection to each piece of equipment.
  - 2. Install flanges, in piping NPS 2-1/2 (DN 65) and larger, adjacent to flanged valves and at final connection to each piece of equipment.

### 3.8 IDENTIFICATION

- A. Identify exposed sanitary waste and vent piping. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

### 3.9 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
  - 1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
  - 2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
  - 1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
  - 2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
  - 3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping except outside leaders on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water (30 kPa). From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
  - 4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg (250 Pa). Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
  - 5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
  - 6. Prepare reports for tests and required corrective action.

### 3.10 CLEANING AND PROTECTION

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.



- D. Exposed ABS and PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

### 3.11 PIPING SCHEDULE

- A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.
- B. Aboveground, soil and waste piping shall be any of the following:
  - 1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
  - 2. Hubless, cast-iron soil pipe and fittings and solvent stack fittings; CISPI hubless-piping couplings; and coupled joints.
  - 3. Copper DWV tube, copper drainage fittings, and soldered joints.
  - 4. Solid-wall ABS pipe, ABS socket fittings, and solvent-cemented joints.
  - 5. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
  - 6. Dissimilar Pipe-Material Couplings: Unshielded, nonpressure transition couplings.
- C. Aboveground, vent piping shall be any of the following:
  - 1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
  - 2. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.
  - 3. Galvanized-steel pipe, drainage fittings, and threaded joints.
  - 4. Stainless-steel pipe and fittings gaskets, and gasketed joints.
  - 5. Copper DWV tube, copper drainage fittings, and soldered joints.
    - a. Option for Vent Piping, NPS 2-1/2 and NPS 3-1/2 (DN 65 and DN 90): Hard copper tube, Type M (Type C); copper pressure fittings; and soldered joints.
  - 6. Solid-wall ABS pipe, ABS socket fittings, and solvent-cemented joints.
  - 7. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
  - 8. Dissimilar Pipe-Material Couplings: Unshielded, nonpressure transition couplings.
- D. Underground, soil, waste, and vent piping shall be any of the following:
  - 1. Extra Heavy or Service class, cast-iron soil piping; gaskets; and gasketed joints.
  - 2. Solid wall ABS pipe, ABS socket fittings, and solvent-cemented joints.
  - 3. Solid wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
  - 4. Dissimilar Pipe-Material Couplings: Unshielded, nonpressure transition couplings.

END OF SECTION 221316

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 221316 – SANITARY WASTE AND VENT PIPING

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the sanitary waste and vent piping is installed and is in general conformance with the Contract Documents, applicable Codes, and shop drawings. The sanitary waste and vent piping has been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

SANITARY WASTE AND VENT PIPING INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_

## SECTION 221319 - SANITARY WASTE PIPING SPECIALTIES

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Cleanouts.
  - 2. Floor drains.
  - 3. Roof flashing assemblies.
  - 4. Through-penetration firestop assemblies.
  - 5. Miscellaneous sanitary drainage piping specialties.
  - 6. Flashing materials.
  - 7. Solids interceptors.
- B. Related Requirements:
  - 1. Section 221423 "Storm Drainage Piping Specialties" for storm drainage piping inside the building, drainage piping specialties, and drains.

## 1.3 DEFINITIONS

- A. ABS: Acrylonitrile-butadiene-styrene plastic.
- B. FRP: Fiberglass-reinforced plastic.
- C. HDPE: High-density polyethylene plastic.
- D. PE: Polyethylene plastic.
- E. PP: Polypropylene plastic.
- F. PVC: Polyvinyl chloride plastic.

## 1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

## 1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For drainage piping specialties to include in emergency, operation, and maintenance manuals.

## 1.6 QUALITY ASSURANCE

- A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic sanitary piping specialty components.

## 1.7 COORDINATION

- A. Coordinate size and location of roof penetrations.

## PART 2 - PRODUCTS

### 2.1 CLEANOUTS

- A. Exposed Metal Cleanouts:
  - 1. ASME A112.36.2M, Cast-Iron Cleanouts:
    - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) MIFAB, Inc.
      - 2) Smith, Jay R. Mfg. Co.
      - 3) Zurn Industries, LLC.
  - 2. Standard: ASME A112.36.2M for cast iron for cleanout test tee.
  - 3. Size: Same as connected drainage piping
  - 4. Body Material: Hub-and-spigot, cast-iron soil pipe T-branch as required to match connected piping.
  - 5. Closure: Countersunk, brass plug.
  - 6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
  - 7. Closure: Stainless-steel plug with seal.
- B. Metal Floor Cleanouts:
  - 1. ASME A112.36.2M, Cast-Iron Cleanouts:
    - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) Sioux Chief Manufacturing Company, Inc.
      - 2) Smith, Jay R. Mfg. Co.
      - 3) Zurn Industries, LLC.
  - 2. Standard: ASME A112.36.2M for threaded, adjustable housing cleanout.
  - 3. Size: Same as connected branch.
  - 4. Type: Threaded, adjustable housing.
  - 5. Body or Ferrule: Cast iron.
  - 6. Clamping Device: Not required.
  - 7. Outlet Connection: Inside calk.
  - 8. Closure: Brass plug with tapered threads.
  - 9. Adjustable Housing Material: Cast iron with threads.
  - 10. Frame and Cover Material and Finish: Nickel-bronze, copper alloy.
  - 11. Frame and Cover Shape: Round.

12. Top Loading Classification: Heavy Duty.
13. Riser: ASTM A 74, Service class, cast-iron drainage pipe fitting and riser to cleanout.

C. Cast-Iron Wall Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. MIFAB, Inc.
  - b. Smith, Jay R. Mfg. Co.
  - c. Zurn Industries, LLC.
2. Standard: ASME A112.36.2M. Include wall access.
3. Size: Same as connected drainage piping.
4. Body: Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure: Countersunk or raised-head, drilled-and-threaded brass plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
7. Wall Access: Round, flat, chrome-plated brass or stainless-steel cover plate with screw.
8. Wall Access: Round, nickel-bronze, or copper-alloy wall-installation frame and cover.

## 2.2 FLOOR DRAINS

A. Cast-Iron Floor Drains:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. MIFAB, Inc.
  - b. Smith, Jay R. Mfg. Co.
  - c. Zurn Industries, LLC.
2. Standard: ASME A112.6.3.
3. Pattern: Floor drain.
4. Body Material: Gray iron.
5. Seepage Flange: Not required.
6. Outlet: Bottom.
7. Sediment Bucket: Not required.
8. Top or Strainer Material: Nickel bronze.
9. Top of Body and Strainer Finish: Nickel bronze.
10. Top Shape: Round.
11. Trap Pattern: Deep-seal P-trap.

## 2.3 ROOF FLASHING ASSEMBLIES

A. Roof Flashing Assemblies:

1. Manufacturers: Subject to compliance with requirements, provide comparable product by one of the following:
  - a. Acorn Engineering Company.
  - b. Thaler Metal Industries Ltd.
2. Description: Manufactured assembly made of 4.0-lb/sq. ft. (20-kg/sq. m), 0.0625-inch- (1.6-mm-) thick, lead flashing collar and skirt extending at least 8 inches (200 mm) from pipe, with galvanized-steel boot reinforcement and counterflashing fitting.
  - a. Open-Top Vent Cap: Without cap.

## 2.4 THROUGH-PENETRATION FIRESTOP ASSEMBLIES

A. Through-Penetration Firestop Assemblies:

1. Manufacturers: Subject to compliance with requirements, provide comparable products by the following:
  - a. ProSet Systems Inc.
2. Standard: UL 1479 assembly of sleeve and stack fitting with firestopping plug.
3. Size: Same as connected soil, waste, or vent stack.
4. Sleeve: Molded PVC plastic, of length to match slab thickness and with integral nailing flange on one end for installation in cast-in-place concrete slabs.

## 2.5 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

- A. Deep-Seal Traps:
  1. Description: Cast-iron or bronze casting, with inlet and outlet matching connected piping and cleanout trap-seal primer valve connection.
  2. Size: Same as connected waste piping.
    - a. NPS 2 (DN 50): 4-inch- (100-mm-) minimum water seal.
    - b. NPS 2-1/2 (DN 65) and Larger: 5-inch- (125-mm-) minimum water seal.
- B. Floor-Drain, Trap-Seal Primer Fittings:
  1. Description: Cast iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
  2. Size: Same as floor drain outlet with NPS 1/2 (DN 15) side inlet.
- C. Air-Gap Fittings:
  1. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.
  2. Body: Bronze or cast iron.
  3. Inlet: Opening in top of body.
  4. Outlet: Larger than inlet.
  5. Size: Same as connected waste piping and with inlet large enough for associated indirect waste piping.
- D. Sleeve Flashing Device:
  1. Description: Manufactured, cast-iron fitting, with clamping device, that forms sleeve for pipe floor penetrations of floor membrane. Include galvanized-steel pipe extension in top of fitting that will extend 1 inch (25 mm) above finished floor and galvanized-steel pipe extension in bottom of fitting that will extend through floor slab.
  2. Size: As required for close fit to riser or stack piping.
- E. Expansion Joints:
  1. Standard: ASME A112.21.2M.
  2. Body: Cast iron with bronze sleeve, packing, and gland.
  3. End Connections: Matching connected piping.
  4. Size: Same as connected soil, waste, or vent piping.

## 2.6 FLASHING MATERIALS

- A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:
  1. General Use: 4.0-lb/sq. ft. (20-kg/sq. m), 0.0625-inch (1.6-mm) thickness.
  2. Vent Pipe Flashing: 3.0-lb/sq. ft. (15-kg/sq. m), 0.0469-inch (1.2-mm) thickness.
  3. Burning: 6-lb/sq. ft. (30-kg/sq. m), 0.0938-inch (2.4-mm) thickness.

- B. Copper Sheet: ASTM B 152/B 152M, of the following minimum weights and thicknesses, unless otherwise indicated:
  - 1. General Applications: 12 oz./sq. ft. (3.7 kg/sq. m or 0.41-mm thickness).
  - 2. Vent Pipe Flashing: 8 oz./sq. ft. (2.5 kg/sq. m or 0.27-mm thickness).
- C. Zinc-Coated Steel Sheet: ASTM A 653/A 653M, with 0.20 percent copper content and 0.04-inch (1.01-mm) minimum thickness, unless otherwise indicated. Include G90 (Z275) hot-dip galvanized, mill-phosphatized finish for painting if indicated.
- D. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil (1.01-mm) minimum thickness.
- E. Fasteners: Metal compatible with material and substrate being fastened.
- F. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.
- G. Solder: ASTM B 32, lead-free alloy.
- H. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

## 2.7 MOTORS

- A. General requirements for motors are specified in Section 220513 "Common Motor Requirements for Plumbing Equipment."
  - 1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Equipment Mounting:
  - 1. Comply with requirements for vibration isolation and seismic control devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
  - 2. Comply with requirements for vibration isolation devices specified in Section 220548.13 "Vibration Controls for Plumbing Piping and Equipment."
- B. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
  - 1. Size same as drainage piping up to NPS 4 (DN 100). Use NPS 4 (DN 100) for larger drainage piping unless larger cleanout is indicated.
  - 2. Locate at each change in direction of piping greater than 45 degrees.
  - 3. Locate at minimum intervals of 50 feet (15 m) for piping NPS 4 (DN 100) and smaller and 100 feet (30 m) for larger piping.
  - 4. Locate at base of each vertical soil and waste stack.
- C. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.
- D. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

- E. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.
  - 1. Position floor drains for easy access and maintenance.
  - 2. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
  - 3. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.
- F. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof.
- G. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof.
- H. Install through-penetration firestop assemblies in plastic conductors at floor penetrations.
- I. Install deep-seal traps on floor drains and other waste outlets, if indicated.
- J. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.
- K. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.
- L. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.
- M. Install vent caps on each vent pipe passing through roof.
- N. Install expansion joints on vertical stacks and conductors. Position expansion joints for easy access and maintenance.

### 3.2 CONNECTIONS

- A. Comply with requirements in Section 221316 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment to allow service and maintenance.
- C. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
- D. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

### 3.3 FLASHING INSTALLATION

- A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:
  - 1. Lead Sheets: Burn joints of lead sheets 6.0-lb/sq. ft. (30-kg/sq. m), 0.0938-inch (2.4-mm) thickness or thicker. Solder joints of lead sheets 4.0-lb/sq. ft. (20-kg/sq. m), 0.0625-inch (1.6-mm) thickness or thinner.
  - 2. Copper Sheets: Solder joints of copper sheets.



- B. Set flashing on floors and roofs in solid coating of bituminous cement.
- C. Secure flashing into sleeve and specialty clamping ring or device.
- D. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Section 076000 "Flashing and Sheet Metal."
- E. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.
- F. Fabricate and install flashing and pans, sumps, and other drainage shapes.

#### 3.4 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 221319

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 221319 – SANITARY WASTE PIPING SPECIALTIES

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the sanitary waste piping specialties are installed and are in general conformance with the Contract Documents, applicable Codes, and shop drawings. The sanitary waste piping specialties have been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

SANITARY WASTE PIPING SPECIALTIES INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_

## SECTION 221413 - FACILITY STORM DRAINAGE PIPING

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Pipe, tube, and fittings.
  - 2. Specialty pipe fittings.
  - 3. Encasement for underground metal piping.

## 1.3 PERFORMANCE REQUIREMENTS

- A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:
  - 1. Storm Drainage Piping: 10-foot head of water (30 kPa).
- B. Seismic Performance: Storm drainage piping and support and installation shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

## 1.4 ACTION SUBMITTALS

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

## 1.5 INFORMATIONAL SUBMITTALS

- A. Seismic Qualification Certificates: For storm drainage piping, accessories, and components, from manufacturer.
  - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
  - 2. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- B. Field quality-control reports.

## 1.6 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF/ANSI 14, "Plastics Piping System Components and Related Materials," for plastic piping components. Include marking with "NSF-drain" for plastic drain piping and "NSF-sewer" for plastic sewer piping.

## PART 2 - PRODUCTS

## 2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

## 2.2 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 74, Service and Extra Heavy classes.
- B. Gaskets: ASTM C 564, rubber.
- C. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

## 2.3 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 888 or CISPI 301.
- B. CISPI, Hubless-Piping Couplings:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Dallas Specialty & Mfg. Co.
    - b. Fernco Inc.
    - c. MIFAB, Inc.
    - d. Tyler Pipe; a subsidiary of McWane Inc.
  - 2. Standards: ASTM C 1277 and CISPI 310.
  - 3. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.
- C. Heavy-Duty, Hubless-Piping Couplings:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Clamp-All Corp.
    - b. Dallas Specialty & Mfg. Co.
    - c. MIFAB, Inc.
    - d. Tyler Pipe; a subsidiary of McWane Inc.
  - 2. Standards: ASTM C 1277 and ASTM C 1540.
  - 3. Description: Stainless-steel shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.
- D. Cast-Iron, Hubless-Piping Couplings:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. MG Piping Products Company.
  - 2. Standard: ASTM C 1277.
  - 3. Description: Two-piece ASTM A 48/A 48M, cast-iron housing; stainless-steel bolts and nuts; and ASTM C 564, rubber sleeve with integral, center pipe stop.

## 2.4 DUCTILE-IRON PIPE AND FITTINGS

- A. Ductile-Iron, Mechanical-Joint Piping:
  - 1. Ductile-Iron Pipe: AWWA C151/A21.51, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated.
  - 2. Ductile-Iron Fittings: AWWA C110/A21.10, mechanical-joint ductile- or gray-iron standard pattern or AWWA C153/A21.53, ductile-iron compact pattern.
  - 3. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.
- B. Ductile-Iron, Push-On-Joint Piping:
  - 1. Ductile-Iron Pipe: AWWA C151/A21.51, with push-on-joint bell and plain spigot end unless grooved or flanged ends are indicated.
  - 2. Ductile-Iron Fittings: AWWA C110/A21.10, push-on-joint ductile- or gray-iron standard pattern or AWWA C153/A21.53, ductile-iron compact pattern.
  - 3. Gaskets: AWWA C111/A21.11, rubber.
- C. Ductile-Iron, Grooved-Joint Piping:
  - 1. Ductile-Iron Pipe: AWWA C151/A21.51 with round-cut-grooved ends according to AWWA C606.
  - 2. Ductile-Iron-Pipe Appurtenances:
    - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) Anvil International.
      - 2) Star Pipe Products.
      - 3) Victaulic Company.
    - b. Grooved-End, Ductile-Iron Fittings: ASTM A 536 ductile-iron castings with dimensions matching AWWA C110/A21.10 ductile-iron pipe or AWWA C153/A21.53 ductile-iron fittings and complying with AWWA C606 for grooved ends.
    - c. Grooved Mechanical Couplings for Ductile-Iron Pipe: ASTM F 1476, Type I. Include ferrous housing sections with continuous curved keys; EPDM-rubber center-leg gasket suitable for hot and cold water; and bolts and nuts.

## 2.5 ABS PIPE AND FITTINGS

- A. Solid-Wall ABS Pipe: ASTM D 2661, Schedule 40.
- B. ABS Socket Fittings: ASTM D 2661, made to ASTM D 3311, drain, waste, and vent patterns.
- C. Solvent Cement: ASTM D 2235.
  - 1. ABS solvent cement shall have a VOC content of 325 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  - 2. Solvent cement shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

## 2.6 PVC PIPE AND FITTINGS

- A. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.
- B. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.

- C. Adhesive Primer: ASTM F 656.
  - 1. Adhesive primer shall have a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  - 2. Adhesive primer shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- D. Solvent Cement: ASTM D 2564.
  - 1. PVC solvent cement shall have a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  - 2. Solvent cement shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

## 2.7 SPECIALTY PIPE FITTINGS

- A. Transition Couplings:
  - 1. General Requirements: Fitting or device for joining piping with small differences in OD's or of different materials. Include end connections same size as and compatible with pipes to be joined.
  - 2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified-piping-system fitting.
  - 3. Unshielded, Nonpressure Transition Couplings:
    - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) Fernco Inc.
      - 2) Plastic Oddities.
    - b. Standard: ASTM C 1173.
    - c. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
    - d. Sleeve Materials:
      - 1) For Cast-Iron Soil Pipes: ASTM C 564, rubber.
      - 2) For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
      - 3) For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.
  - 4. Shielded, Nonpressure Transition Couplings:
    - a. Manufacturers: Subject to compliance with requirements, provide products by the following:
      - 1) Cascade Waterworks Mfg. Co.
    - b. Standard: ASTM C 1460.
    - c. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
  - 5. Pressure Transition Couplings:
    - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) Cascade Waterworks Mfg. Co.
      - 2) Dresser, Inc.
      - 3) EBAA Iron, Inc.
      - 4) JCM Industries, Inc.
      - 5) Romac Industries, Inc.
      - 6) Smith, Jay R. Mfg. Co.
      - 7) Viking Johnson.
    - b. Standard: AWWA C219.

- c. Description: Metal, sleeve-type couplings same size as, with pressure rating at least equal to and ends compatible with, pipes to be joined.
  - d. Center-Sleeve Material: Manufacturer's standard.
  - e. Gasket Material: Natural or synthetic rubber.
  - f. Metal Component Finish: Corrosion-resistant coating or material.
- B. Dielectric Fittings:
- 1. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
  - 2. Dielectric Unions:
    - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) A.Y. McDonald Mfg. Co.
      - 2) Capitol Manufacturing Company.
      - 3) Central Plastics Company.
      - 4) HART Industrial Unions, LLC.
      - 5) Watts; a Watts Water Technologies company.
      - 6) Wilkins.
    - b. Description:
      - 1) Standard: ASSE 1079.
      - 2) Pressure Rating: 150 psig (1035 kPa) at 180 deg F (82 deg C).
      - 3) End Connections: Solder-joint copper alloy and threaded ferrous.
  - 3. Dielectric Flanges:
    - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) Capitol Manufacturing Company.
      - 2) Central Plastics Company.
      - 3) Watts; a Watts Water Technologies company.
      - 4) Wilkins.
    - b. Description:
      - 1) Standard: ASSE 1079.
      - 2) Factory-fabricated, bolted, companion-flange assembly.
      - 3) Pressure Rating: 150 psig (1035 kPa).
      - 4) End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.
  - 4. Dielectric-Flange Insulating Kits:
    - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) Advance Products & Systems, Inc.
      - 2) Calpico, Inc.
      - 3) Central Plastics Company.
      - 4) Pipeline Seal and Insulator, Inc.
    - b. Description:
      - 1) Nonconducting materials for field assembly of companion flanges.
      - 2) Pressure Rating: 150 psig (1035 kPa).
      - 3) Gasket: Neoprene or phenolic.
      - 4) Bolt Sleeves: Phenolic or polyethylene.
      - 5) Washers: Phenolic with steel-backing washers.
  - 5. Dielectric Nipples:
    - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) Elster Perfection Corporation.
      - 2) Grinnell Mechanical Products.
      - 3) Precision Plumbing Products.
      - 4) Victaulic Company.

## b. Description:

- 1) Electroplated steel nipple complying with ASTM F 1545.
- 2) Pressure Rating: 300 psig (2070 kPa) at 225 deg F (107 deg C).
- 3) End Connections: Male threaded or grooved.
- 4) Lining: Inert and noncorrosive, propylene.

## 2.8 ENCASEMENT FOR UNDERGROUND METAL PIPING

- A. Standard: ASTM A 674 or AWWA C105.
- B. Material: High-density, crosslaminated PE film of 0.004-inch (0.10-mm) or LLDPE film of 0.008-inch (0.20-mm) minimum thickness.
- C. Form: Sheet or tube.
- D. Color: Black or natural.

## PART 3 - EXECUTION

## 3.1 EARTH MOVING

- A. Comply with requirements for excavating, trenching, and backfilling specified in Section 310020 "Earthwork."

## 3.2 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations from layout are approved on coordination drawings.
- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping to permit valve servicing.
- F. Install piping at indicated slopes.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Install piping to allow application of insulation.



- J. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- K. Make changes in direction for storm drainage piping using appropriate branches, bends, and long-sweep bends. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- L. Lay buried building storm drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.
- M. Install storm drainage piping at the following minimum slopes unless otherwise indicated:
  - 1. Building Storm Drain: 2 percent downward in direction of flow for piping NPS 3 (DN 80) and smaller; 1 percent downward in direction of flow for piping NPS 4 (DN 100) and larger.
  - 2. Horizontal Storm-Drainage Piping: 2 percent downward in direction of flow.
- N. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
- O. Install steel piping according to applicable plumbing code.
- P. Install aboveground ABS piping according to ASTM D 2661.
- Q. Install aboveground PVC piping according to ASTM D 2665.
- R. Install underground ABS and PVC piping according to ASTM D 2321.
- S. Plumbing Specialties:
  - 1. Install cleanouts at grade and extend to where building storm drains connect to building storm sewers in storm drainage gravity-flow piping. Install cleanout fitting with closure plug inside the building in storm drainage force-main piping. Comply with requirements for cleanouts specified in Section 221423 "Storm Drainage Piping Specialties."
  - 2. Install drains in storm drainage gravity-flow piping. Comply with requirements for drains specified in Section 221423 "Storm Drainage Piping Specialties."
- T. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
- U. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- V. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- W. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

### 3.3 JOINT CONSTRUCTION

- A. Hub-and-Spigot, Cast-Iron Soil Piping Gasketed Joints: Join according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
- B. Hub-and-Spigot, Cast-Iron Soil Piping Calked Joints: Join according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead-and-oakum calked joints.
- C. Hubless, Cast-Iron Soil Piping Coupled Joints: Join according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.
- D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
  - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
  - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- E. Join copper tube and fittings with soldered joints according to ASTM B 828 procedure. Use ASTM B 813, water-flushable, lead-free flux and ASTM B 32, lead-free-alloy solder.
- F. Grooved Joints: Cut groove ends of pipe according to AWWA C606. Lubricate and install gasket over ends of pipes or pipe and fittings. Install coupling housing sections, over gasket, with keys seated in piping grooves. Install and tighten housing bolts.
- G. Flanged Joints: Align bolt holes. Select appropriate gasket material, size, type, and thickness. Install gasket concentrically positioned. Use suitable lubricants on bolt threads. Torque bolts in cross pattern.
- H. Plastic, Nonpressure-Piping, Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
  - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
  - 2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 Appendixes.
  - 3. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 Appendixes.

### 3.4 SPECIALTY PIPE FITTING INSTALLATION

- A. Transition Couplings:
  - 1. Install transition couplings at joints of piping with small differences in OD's.
  - 2. In Drainage Piping: Unshielded, nonpressure transition couplings.
  - 3. In Aboveground Force-Main Piping: Fitting-type transition couplings.
  - 4. In Underground Force-Main Piping:
    - a. NPS 1-1/2 (DN 40) and Smaller: Fitting-type transition couplings.
    - b. NPS 2 (DN 50) and Larger: Pressure transition couplings.
- B. Dielectric Fittings:
  - 1. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
  - 2. Dielectric Fittings for NPS 2 (DN 50) and Smaller: Use dielectric unions.
  - 3. Dielectric Fittings for NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Use dielectric flanges.
  - 4. Dielectric Fittings for NPS 5 (DN 125) and Larger: Use dielectric flange kits.

### 3.5 VALVE INSTALLATION

- A. General valve installation requirements are specified in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.14 "Check Valves for Plumbing Piping," and Section 220523.15 "Gate Valves for Plumbing Piping."
- B. Shutoff Valves: Install shutoff valve on each sump pump discharge.
  - 1. Install gate or full-port ball valve for piping NPS 2 (DN 50) and smaller.
  - 2. Install gate valve for piping NPS 2-1/2 (DN 65) and larger.
- C. Check Valves: Install swing-check valve, between pump and shutoff valve, on each sump pump discharge.

### 3.6 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- B. Comply with requirements for pipe hanger and support devices and installation specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
  - 1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
  - 2. Install stainless-steel pipe hangers for horizontal piping in corrosive environments.
  - 3. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
  - 4. Install stainless-steel pipe support clamps for vertical piping in corrosive environments.
  - 5. Vertical Piping: MSS Type 8 or Type 42, clamps.
  - 6. Individual, Straight, Horizontal Piping Runs:
    - a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
    - b. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.
    - c. Longer Than 100 Feet (30 m) if Indicated: MSS Type 49, spring cushion rolls.
  - 7. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
  - 8. Base of Vertical Piping: MSS Type 52, spring hangers.
- C. Support horizontal piping and tubing within 12 inches (300 mm) of each fitting[, **valve**,] and coupling.
- D. Support vertical piping and tubing at base and at each floor.
- E. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch (10-mm) minimum rods.
- F. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
  - 1. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 60 inches (1500 mm) with 3/8-inch (10-mm) rod.
  - 2. NPS 3 (DN 80): 60 inches (1500 mm) with 1/2-inch (13-mm) rod.
  - 3. NPS 4 and NPS 5 (DN 100 and DN 125): 60 inches (1500 mm) with 5/8-inch (16-mm) rod.
  - 4. NPS 6 and NPS 8 (DN 150 and DN 200): 60 inches (1500 mm) with 3/4-inch (19-mm) rod.
  - 5. NPS 10 and NPS 12 (DN 250 and DN 300): 60 inches (1500 mm) with 7/8-inch (22-mm) rod.
  - 6. Spacing for 10-foot (3-m) pipe lengths may be increased to 10 feet (3 m). Spacing for fittings is limited to 60 inches (1500 mm).

- G. Install supports for vertical cast-iron soil piping every 15 feet (4.5 m).
- H. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:
  - 1. NPS 1-1/4 (DN 32): 84 inches (2100 mm) with 3/8-inch (10-mm) rod.
  - 2. NPS 1-1/2 (DN 40): 108 inches (2700 mm) with 3/8-inch (10-mm) rod.
  - 3. NPS 2 (DN 50): 10 feet (3 m) with 3/8-inch (10-mm) rod.
  - 4. NPS 2-1/2 (DN 65): 11 feet (3.4 m) with 1/2-inch (13-mm) rod.
  - 5. NPS 3 (DN 80): 12 feet (3.7 m) with 1/2-inch (13-mm) rod.
  - 6. NPS 4 and NPS 5 (DN 100 and DN 125): 12 feet (3.7 m) with 5/8-inch (16-mm) rod.
  - 7. NPS 6 and NPS 8 (DN 150 and DN 200): 12 feet (3.7 m) with 3/4-inch (19-mm) rod.
  - 8. NPS 10 and NPS 12 (DN 250 and DN 300): 12 feet (3.7 m) with 7/8-inch (22-mm) rod.
- I. Install supports for vertical steel piping every 15 feet (4.5 m).
- J. Install hangers for **[ABS]** **[and]** **[PVC]** piping with the following maximum horizontal spacing and minimum rod diameters:
  - 1. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 48 inches (1200 mm) with 3/8-inch (10-mm) rod.
  - 2. NPS 3 (DN 80): 48 inches (1200 mm) with 1/2-inch (13-mm) rod.
  - 3. NPS 4 and NPS 5 (DN 100 and DN 125): 48 inches (1200 mm) with 5/8-inch (16-mm) rod.
  - 4. NPS 6 and NPS 8 (DN 150 and DN 200): 48 inches (1200 mm) with 3/4-inch (19-mm) rod.
  - 5. NPS 10 and NPS 12 (DN 250 and DN 300): 48 inches (1200 mm) with 7/8-inch (22-mm) rod.
- K. Install supports for vertical **[ABS]** **[and]** **[PVC]** piping every 48 inches (1200 mm).
- L. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

### 3.7 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect interior storm drainage piping to exterior storm drainage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect storm drainage piping to roof drains and storm drainage specialties.
  - 1. Install test tees (wall cleanouts) in conductors near floor, and floor cleanouts with cover flush with floor.
- D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.
- E. Make connections according to the following unless otherwise indicated:
  - 1. Install unions, in piping NPS 2 (DN 50) and smaller, adjacent to each valve and at final connection to each piece of equipment.
  - 2. Install flanges, in piping NPS 2-1/2 (DN 65) and larger, adjacent to flanged valves and at final connection to each piece of equipment.

### 3.8 IDENTIFICATION

- A. Identify exposed storm drainage piping. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

### 3.9 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
  - 1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in.
  - 2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Test storm drainage piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
  - 1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
  - 2. Leave uncovered and unconcealed new, altered, extended, or replaced storm drainage piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
  - 3. Test Procedure: Test storm drainage piping[, **except outside leaders,**] on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water (30 kPa). From 15 minutes before inspection starts until completion of inspection, water level must not drop. Inspect joints for leaks.
  - 4. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
  - 5. Prepare reports for tests and required corrective action.

### 3.10 CLEANING

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.

### 3.11 PIPING SCHEDULE

- A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.
- B. Aboveground storm drainage piping shall be any of the following:
  - 1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
  - 2. Hubless, cast-iron soil pipe and fittings; CISPI, hubless-piping couplings; and coupled joints.

3. Solid-wall ABS pipe, ABS socket fittings, and solvent-cemented joints.
  4. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
  5. Dissimilar Pipe-Material Couplings: Unshielded, nonpressure transition couplings.
- C. Underground storm drainage piping shall be any of the following:
1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
  2. Solid-wall ABS pipe, ABS socket fittings, and solvent-cemented joints.
  3. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
  4. Dissimilar Pipe-Material Couplings: Unshielded, non-pressure transition couplings.

END OF SECTION 221413

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 221413 – FACILITY STORM DRAINAGE PIPING

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the facility storm drainage piping is installed and is in general conformance with the Contract Documents, applicable Codes, and shop drawings. The facility storm drainage piping has been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

FACILITY STORM DRAINAGE PIPING INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_





## SECTION 221423 - STORM DRAINAGE PIPING SPECIALTIES

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Roof drains.
  - 2. Miscellaneous storm drainage piping specialties.
  - 3. Cleanouts.
  - 4. Backwater valves.
  - 5. Trench drains.
  - 6. Channel drainage systems.
  - 7. Through-penetration firestop assemblies.
  - 8. Flashing materials.

## 1.3 ACTION SUBMITTALS

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

## 1.4 QUALITY ASSURANCE

- A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

## PART 2 - PRODUCTS

## 2.1 MISCELLANEOUS STORM DRAINAGE PIPING SPECIALTIES

- A. Downspout Adaptors:
  - 1. Description: Manufactured, gray-iron casting, for attaching to horizontal-outlet, parapet roof drain and to exterior, sheet metal downspout.
  - 2. Size: Inlet size to match parapet drain outlet.
- B. Downspout Boots:
  - 1. Description: Manufactured, ASTM A 48/A 48M, gray-iron casting, with strap or ears for attaching to building; NPS 4 (DN 100) outlet; and shop-applied bituminous coating.
  - 2. Size: Inlet size to match downspout and NPS 4 (DN 100) outlet.
- C. Conductor Nozzles:
  - 1. Description: Bronze body with threaded inlet and bronze wall flange with mounting holes.
  - 2. Size: Same as connected conductor.

## 2.2 CLEANOUTS

### A. Floor Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Josam Company.
  - b. Oatey.
  - c. Sioux Chief Manufacturing Company, Inc.
  - d. Smith, Jay R. Mfg. Co.
  - e. Tyler Pipe; a subsidiary of McWane Inc.
  - f. Zurn Industries, LLC.
2. Standard: ASME A112.36.2M, for threaded, adjustable housing cleanouts.
3. Size: Same as connected branch.
4. Type: Adjustable housing.
5. Body or Ferrule Material: Cast iron.
6. Clamping Device: Not required.
7. Closure: Brass plug with tapered threads.
8. Adjustable Housing Material: Cast iron with threads.
9. Frame and Cover Material and Finish: Nickel-bronze, copper alloy.
10. Frame and Cover Shape: Round.
11. Top-Loading Classification: Heavy Duty.
12. Riser: ASTM A 74, Service class, cast-iron drainage pipe fitting and riser to cleanout.

### B. Test Tees:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Josam Company.
  - b. MIFAB, Inc.
  - c. Smith, Jay R. Mfg. Co.
  - d. Zurn Industries, LLC.
2. Standard: ASME A112.36.2M and ASTM A 74, ASTM A 888, or CISPI 301, for cleanout test tees.
3. Size: Same as connected drainage piping.
4. Body Material: Hub-and-spigot, cast-iron soil-pipe T-branch or hubless, cast-iron soil-pipe test tee as required to match connected piping.
5. Closure Plug: Countersunk.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

### C. Wall Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Josam Company.
  - b. MIFAB, Inc.
  - c. Smith, Jay R. Mfg. Co.
  - d. Zurn Industries, LLC.
2. Standard: ASME A112.36.2M, for cleanouts. Include wall access.
3. Size: Same as connected drainage piping.
4. Body Material: as required to match connected piping.
5. Closure: Countersunk, drilled-and-threaded brass plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
7. Wall Access: Round, flat, chrome-plated brass or stainless-steel cover plate with screw.
8. Wall Access: Round, nickel-bronze, copper-alloy, wall-installation frame and cover.

## 2.3 THROUGH-PENETRATION FIRESTOP ASSEMBLIES

- A. Through-Penetration Firestop Assemblies:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. ProSet Systems Inc.
  - 2. Standard: ASTM E 814, for through-penetration firestop assemblies.
  - 3. Size: Same as connected pipe.
  - 4. Sleeve: Molded PVC plastic, of length to match slab thickness and with integral nailing flange on one end for installation in cast-in-place concrete slabs.
  - 5. Stack Fitting: ASTM A 48/A 48M, gray-iron, hubless-pattern, wye branch with neoprene O-ring at base and gray-iron plug in thermal-release harness. Include PVC protective cap for plug.
  - 6. Special Coating: Corrosion resistant on interior of fittings.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install downspout adapters on outlet of back-outlet parapet roof drains and connect to sheet metal downspouts.
- B. Install downspout boots at grade with top 12 inches (305 mm) above grade. Secure to building wall.
- C. Install conductor nozzles at exposed bottom of conductors where they spill onto grade.
- D. Install cleanouts in aboveground piping and building drain piping according to the following instructions unless otherwise indicated:
  - 1. Use cleanouts the same size as drainage piping up to NPS 4 (DN 100). Use NPS 4 (DN 100) for larger drainage piping unless larger cleanout is indicated.
  - 2. Locate cleanouts at each change in direction of piping greater than 45 degrees.
  - 3. Locate cleanouts at minimum intervals of 50 feet (15 m) for piping NPS 4 (DN 100) and smaller and 100 feet (30 m) for larger piping.
  - 4. Locate cleanouts at base of each vertical soil and waste stack.
- E. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.
- F. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.
- G. Install test tees in vertical conductors and near floor.
- H. Install wall cleanouts in vertical conductors. Install access door in wall if indicated.
- I. Install through-penetration firestop assemblies in plastic conductors at concrete floor penetrations.
- J. Install sleeve flashing device with each conductor passing through floors with waterproof membrane.

3.2 CONNECTIONS

- A. Comply with requirements for piping specified in Section 221413 "Facility Storm Drainage Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

3.3 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 221423

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 221423 – STORM DRAINAGE PIPING SPECIALTIES

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the storm drainage piping specialties are installed and are in general conformance with the Contract Documents, applicable Codes, and shop drawings. The storm drainage piping specialties have been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

STORM DRAINAGE PIPING SPECIALTIES INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_

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## SECTION 221513 - GENERAL-SERVICE COMPRESSED-AIR PIPING

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes piping and related specialties for general-service compressed-air systems operating at 200 psig (1380 kPa) or less.

## 1.3 DEFINITIONS

- A. ABS: Acrylonitrile-butadiene-styrene plastic.
- B. CR: Chlorosulfonated polyethylene synthetic rubber.
- C. EPDM: Ethylene-propylene-diene terpolymer rubber.
- D. HDPE: High-density polyethylene plastic.
- E. NBR: Acrylonitrile-butadiene rubber.
- F. PE: Polyethylene plastic.
- G. PVC: Polyvinyl chloride plastic.
- H. High-Pressure Compressed-Air Piping: System of compressed-air piping and specialties operating at pressures between 150 and 200 psig (1035 and 1380 kPa).
- I. Low-Pressure Compressed-Air Piping: System of compressed-air piping and specialties operating at pressures of 150 psig (1035 kPa) or less.

## 1.4 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Compressed-air piping and support and installation shall withstand effects of seismic events determined according to SEI/ASCE 7, "Minimum Design Loads for Buildings and Other Structures."

## 1.5 ACTION SUBMITTALS

- A. Product Data: For the following:
  - 1. Dielectric fittings.
  - 2. Flexible pipe connectors.
  - 3. Safety valves.

4. Pressure regulators. Include rated capacities and operating characteristics.
5. Automatic drain valves.
6. Filters. Include rated capacities and operating characteristics.
7. Lubricators. Include rated capacities and operating characteristics.
8. Quick couplings.
9. Hose assemblies.

## 1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For general-service compressed-air piping specialties to include in emergency, operation, and maintenance manuals.

## 1.7 QUALITY ASSURANCE

- A. Installer Qualifications:
  1. Pressure-Seal Joining Procedure for Copper Tubing: Qualify operators according to training provided by Viega; Plumbing and Heating Systems.
  2. Pressure-Seal Joining Procedure for Steel Piping. Qualify operators according to training provided by Victaulic Company.
- B. Brazing: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications," or to AWS B2.2, "Standard for Brazing Procedure and Performance Qualification."
- C. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX.
- D. ASME Compliance:
  1. Comply with ASME B31.1, "Power Piping," for high-pressure compressed-air piping.
  2. Comply with ASME B31.9, "Building Services Piping," for low-pressure compressed-air piping.

## PART 2 - PRODUCTS

### 2.1 PIPES, TUBES, AND FITTINGS

- A. Schedule 40, Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B, black or hot-dip zinc coated with ends threaded according to ASME B1.20.1.
  1. Steel Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106, Schedule 40, galvanized seamless steel pipe. Include ends matching joining method.
  2. Malleable-Iron Fittings: ASME B16.3, Class 150 or 300, threaded.
  3. Malleable-Iron Unions: ASME B16.39, Class 150 or 300, threaded.
  4. Steel Flanges: ASME B16.5, Class 150 or 300, carbon steel, threaded.
  5. Wrought-Steel Butt-Welding Fittings: ASME B16.9, Schedule 40.
  6. Steel Flanges: ASME B16.5, Class 150 or 300, carbon steel.
  7. Grooved-End Fittings and Couplings:
    - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:



- 1) Anvil International.
  - 2) Star Pipe Products.
  - 3) Victaulic Company.
  - 4) Ward Manufacturing, Inc.
  - b. Grooved-End Fittings: ASTM A 47/A 47M, malleable-iron castings or ASTM A 536, ductile-iron casting; with grooves according to AWWA C606 and dimensions matching steel pipe.
  - c. Couplings: AWWA C606 or UL 213, for steel-pipe dimensions and rated for 300-psig (2070-kPa) minimum working pressure. Include ferrous housing sections, gasket suitable for compressed air, and bolts and nuts. Provide EDPM gaskets for oil-free compressed air. Provide NBR gaskets if compressed air contains oil or oil vapor.
- B. Schedule 5, Steel Pipe: ASTM A 135, carbon steel with plain ends and zinc-plated finish.
1. Pressure-Seal Fittings: Listed and labeled by a qualified testing agency and FMG-approved, carbon-steel, pressure-seal housing with O-ring end seals suitable for compressed-air piping and rated for 300-psig (2070-kPa) minimum working pressure. Provide EDPM seals for oil-free compressed air. Provide NBR seals if compressed air contains oil or oil vapor.
    - a. Manufacturers: Subject to compliance with requirements, provide products by the following:
      - 1) Victaulic Company.
- C. Copper Tube: ASTM B 88, Type K or L (ASTM B 88M, Type A or B) seamless, drawn-temper, water tube.
1. Wrought-Copper Fittings: ASME B16.22, solder-joint pressure type or MSS SP-73, wrought copper with dimensions for brazed joints.
  2. Cast-Copper-Alloy Flanges: ASME B16.24, Class 150 or 300.
  3. Copper Unions: ASME B16.22 or MSS SP-123.
  4. Press-Type Fittings, NPS 2 (DN 50) and Smaller: Wrought-copper fitting with EPDM O-ring seal in each end.
    - a. Manufacturers: Subject to compliance with requirements, provide products by the following:
      - 1) Viega LLC.
  5. Press-Type Fittings, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Bronze fitting with stainless-steel grip ring and EPDM O-ring seal in each end.
    - a. Manufacturers: Subject to compliance with requirements, provide products by the following:
      - 1) Viega LLC.
  6. Extruded-Tee Outlets: Procedure for making branch outlets in copper tube according to ASTM F 2014.
    - a. Manufacturers: Subject to compliance with requirements, provide products by the following:
      - 1) T-DRILL Industries Inc.
  7. Grooved-End Fittings and Couplings:
    - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) Anvil International.
      - 2) Victaulic Company.
    - b. Grooved-End Fittings: ASTM B 75 (ASTM B 75M), copper tube or ASTM B 584, bronze castings.
    - c. Couplings: Copper-tube dimensions and design similar to AWWA C606. Include ferrous housing sections, gasket suitable for compressed air, and bolts and nuts. Provide EDPM gasket for oil-free compressed air. Provide NBR gasket if compressed air contains oil or oil vapor.

- D. Transition Couplings for Metal Piping: Metal coupling or other manufactured fitting same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.
- E. Blue ABS Piping System: Made of ASTM D 3965, ABS-resin modified to provide shatter-

## 2.2 JOINING MATERIALS

- A. Pipe-Flange Gasket Materials: Suitable for compressed-air piping system contents.
  - 1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch (3.2-mm) maximum thickness unless thickness or specific material is indicated.
    - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
    - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
- B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- C. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- D. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated.
- E. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

## 2.3 VALVES

- A. Metal Ball, Butterfly, Check, and Gate Valves: Comply with requirements in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.13 "Butterfly Valves for Plumbing Piping," Section 220523.14 "Check Valves for Plumbing Piping," and Section 220523.15 "Gate Valves for Plumbing Piping."

## 2.4 DIELECTRIC FITTINGS

- A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
- B. Dielectric Unions:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Capitol Manufacturing Company.
    - b. Central Plastics Company.
    - c. HART Industrial Unions, LLC.
    - d. Jomar Valve.
    - e. Matco-Norca.
    - f. Watts; a Watts Water Technologies company.
    - g. Wilkins.
  - 2. Description:
    - a. Standard: ASSE 1079.
    - b. Pressure Rating: 150 psig (1035 kPa).
    - c. End Connections: Solder-joint copper alloy and threaded ferrous.

- C. Dielectric Flanges:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Capitol Manufacturing Company.
    - b. Central Plastics Company.
    - c. Matco-Norca.
    - d. Watts; a Watts Water Technologies company.
    - e. Wilkins.
  2. Description:
    - a. Standard: ASSE 1079.
    - b. Factory-fabricated, bolted, companion-flange assembly.
    - c. Pressure Rating: 150 psig (1035 kPa).
    - d. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.
- D. Dielectric-Flange Insulating Kits:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Advance Products & Systems, Inc.
    - b. Calpico, Inc.
    - c. Central Plastics Company.
    - d. Pipeline Seal and Insulator, Inc.
  2. Description:
    - a. Nonconducting materials for field assembly of companion flanges.
    - b. Pressure Rating: 150 psig (1035 kPa).
    - c. Gasket: Neoprene or phenolic.
    - d. Bolt Sleeves: Phenolic or polyethylene.
    - e. Washers: Phenolic with steel backing washers.

## 2.5 FLEXIBLE PIPE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Flex-Hose Co., Inc.
  2. Flexicraft Industries.
  3. Hyspan Precision Products, Inc.
  4. Mercer Rubber Co.
  5. Metraflex Company (The).
  6. Proco Products, Inc.
  7. Unaflex.
  8. Universal Metal Hose.
- B. Bronze-Hose Flexible Pipe Connectors: Corrugated-bronze tubing with bronze wire-braid covering and ends brazed to inner tubing.
1. Working-Pressure Rating: 250 psig (1725 kPa) minimum.
  2. End Connections, NPS 2 (DN 50) and Smaller: Threaded copper pipe or plain-end copper tube.
  3. End Connections, NPS 2-1/2 (DN 65) and Larger: Flanged copper alloy.
- C. Stainless-Steel-Hose Flexible Pipe Connectors: Corrugated-stainless-steel tubing with stainless-steel wire-braid covering and ends welded to inner tubing.
1. Working-Pressure Rating: 250 psig (1725 kPa) minimum.
  2. End Connections, NPS 2 (DN 50) and Smaller: Threaded steel pipe nipple.
  3. End Connections, NPS 2-1/2 (DN 65) and Larger: Flanged steel nipple.

## 2.6 SPECIALTIES

- A. Safety Valves: ASME Boiler and Pressure Vessel Code: Section VIII, "Pressure Vessels," construction; National Board certified, labeled, and factory sealed; constructed of bronze body with poppet-type safety valve for compressed-air service.
  - 1. Pressure Settings: Higher than discharge pressure and same or lower than receiver pressure rating.
- B. Air-Main Pressure Regulators: Bronze body, direct acting, spring-loaded manual pressure-setting adjustment, and rated for 250-psig (1725-kPa) inlet pressure, unless otherwise indicated.
  - 1. Type: Pilot operated.
- C. Air-Line Pressure Regulators: Diaphragm or pilot operated, bronze body, direct acting, spring-loaded manual pressure-setting adjustment, and rated for 200-psig (1380-kPa) minimum inlet pressure, unless otherwise indicated.
- D. Automatic Drain Valves: Stainless-steel body and internal parts, rated for 200-psig (1380-kPa) minimum working pressure, capable of automatic discharge of collected condensate. Include mounting bracket if wall mounting is required.

## 2.7 QUICK COUPLINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 1. Aeroquip Corporation.
  - 2. Bowes Manufacturing Inc.
  - 3. Foster Manufacturing, Inc.
  - 4. Milton Industries, Inc.
  - 5. Parker Hannifin Corp.
  - 6. Rectus Corp.
  - 7. Schrader-Bridgeport/Standard Thomson.
  - 8. TOMCO Products Inc.
  - 9. Tuthill Corporation.
- B. General Requirements for Quick Couplings: Assembly with locking-mechanism feature for quick connection and disconnection of compressed-air hose.
- C. Automatic-Shutoff Quick Couplings: Straight-through brass body with O-ring or gasket seal and stainless-steel or nickel-plated-steel operating parts.
  - 1. Socket End: With one-way valve and threaded inlet for connection to piping or threaded hose fitting.
- D. Valveless Quick Couplings: Straight-through brass body with stainless-steel or nickel-plated-steel operating parts.
  - 1. Socket End: With O-ring or gasket seal, without valve, and with barbed inlet for attaching hose.
  - 2. Plug End: With barbed outlet for attaching hose.

## 2.8 HOSE ASSEMBLIES

- A. Description: Compatible hose, clamps, couplings, and splicers suitable for compressed-air service, of nominal diameter indicated, and rated for 300-psig (2070-kPa) minimum working pressure, unless otherwise indicated.

1. Hose: Reinforced single- or double-wire-braid, CR-covered hose for compressed-air service.
2. Hose Clamps: Stainless-steel clamps or bands.
3. Hose Couplings: Two-piece, straight-through, threaded brass or stainless-steel O-ring or gasket-seal swivel coupling with barbed ends for connecting two sections of hose.
4. Hose Splicers: One-piece, straight-through brass or stainless-steel fitting with barbed ends for connecting two sections of hose.

## PART 3 - EXECUTION

### 3.1 PIPING APPLICATIONS

- A. Compressed-Air Piping between Air Compressors and Receivers: Use one of the following piping materials for each size range:
1. NPS 2 (DN 50) and Smaller: Schedule 40, black-steel pipe; threaded, malleable-iron fittings; and threaded joints.
  2. NPS 2 (DN 50) and Smaller: Schedule 40, black-steel pipe; wrought-steel fittings; and welded joints.
  3. NPS 2 (DN 50) and Smaller: Type K or L (Type A or B), copper tube; wrought-copper fittings; and brazed joints.
  4. NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Schedule 40, black-steel pipe; threaded, malleable-iron fittings; and threaded joints.
  5. NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Schedule 40, black-steel pipe; grooved-end fittings; couplings; and grooved joints.
  6. NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Schedule 40, black-steel pipe; wrought-steel fittings; and welded joints.
  7. NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Type K or L (Type A or B), copper tube; wrought-copper fittings; and brazed joints.

### 3.2 VALVE APPLICATIONS

- A. Metal General-Duty Valves: Comply with requirements and use valve types specified in "Valve Applications" Articles in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.13 "Butterfly Valves for Plumbing Piping," Section 220523.14 "Check Valves for Plumbing Piping," and Section 220523.15 "Gate Valves for Plumbing Piping," according to the following:
1. Low-Pressure Compressed Air: Valve types specified for low-pressure compressed air.
  2. High-Pressure Compressed Air: Valve types specified for medium-pressure compressed air.
  3. Equipment Isolation NPS 2 (DN 50) and Smaller: Safety-exhaust, copper-alloy ball valve with exhaust vent and pressure rating at least as great as piping system operating pressure.
  4. Grooved-end valves may be used with grooved-end piping and grooved joints.

### 3.3 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of compressed-air piping. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, air-compressor sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

- B. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited, unless otherwise indicated.
- C. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal and to coordinate with other services occupying that space.
- D. Install piping adjacent to equipment and machines to allow service and maintenance.
- E. Install air and drain piping with 1 percent slope downward in direction of flow.
- F. Install nipples, flanges, unions, transition and special fittings, and valves with pressure ratings same as or higher than system pressure rating, unless otherwise indicated.
- G. Equipment and Specialty Flanged Connections:
  - 1. Use steel companion flange with gasket for connection to steel pipe.
  - 2. Use cast-copper-alloy companion flange with gasket and brazed[ **or soldered**] joint for connection to copper tube. Do not use soldered joints for connection to air compressors or to equipment or machines producing shock or vibration.
- H. Install eccentric reducers where compressed-air piping is reduced in direction of flow, with bottoms of both pipes and reducer fitting flush.
- I. Install branch connections to compressed-air mains from top of main. Provide drain leg and drain trap at end of each main and branch and at low points.
- J. Install thermometer and pressure gage on discharge piping from each air compressor and on each receiver. Comply with requirements in Section 220519 "Meters and Gages for Plumbing Piping."
- K. Install piping to permit valve servicing.
- L. Install piping free of sags and bends.
- M. Install fittings for changes in direction and branch connections.
- N. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- O. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

### 3.4 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
  - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.

2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- D. Welded Joints for Steel Piping: Join according to AWS D10.12/D10.12M.
- E. Brazed Joints for Copper Tubing: Join according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter.
- F. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Join according to ASTM B 828 or CDA's "Copper Tube Handbook."
- G. Flanged Joints: Use asbestos-free, nonmetallic gasket suitable for compressed air. Join flanges with gasket and bolts according to ASME B31.9 for bolting procedure.
- H. Grooved Joints: Assemble couplings with housing, gasket, lubricant, and bolts. Join according to AWWA C606 for grooved joints. Do not apply lubricant to prelubricated gaskets.
- I. Dissimilar Metal Piping Material Joints: Use dielectric fittings.

### 3.5 VALVE INSTALLATION

- A. General-Duty Valves: Comply with requirements in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.13 "Butterfly Valves for Plumbing Piping," Section 220523.14 "Check Valves for Plumbing Piping," and Section 220523.15 "Gate Valves for Plumbing Piping."
- B. Install shutoff valves and unions or flanged joints at compressed-air piping to air compressors.
- C. Install shutoff valve at inlet to each automatic drain valve, filter, lubricator, and pressure regulator.
- D. Install check valves to maintain correct direction of compressed-air flow to and from compressed-air piping specialties and equipment.

### 3.6 DIELECTRIC FITTING INSTALLATION

- A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
- B. NPS 2 (DN 50) and Smaller: Use dielectric unions.
- C. NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Use dielectric flanges.

### 3.7 FLEXIBLE PIPE CONNECTOR INSTALLATION

- A. Install flexible pipe connectors in discharge piping and in inlet air piping from remote air-inlet filter of each air compressor.
- B. Install bronze-hose flexible pipe connectors in copper compressed-air tubing.
- C. Install stainless-steel-hose flexible pipe connectors in steel compressed-air piping.

### 3.8 SPECIALTY INSTALLATION

- A. Install safety valves on receivers in quantity and size to relieve at least the capacity of connected air compressors.
- B. Install air-main pressure regulators in compressed-air piping at or near air compressors.
- C. Install air-line pressure regulators in branch piping to equipment and tools.
- D. Install automatic drain valves on aftercoolers, receivers, and dryers. Discharge condensate onto nearest floor drain.
- E. Install air-line lubricators in branch piping to machine tools. Mount on wall at locations indicated.
- F. Install quick couplings at piping terminals for hose connections.
- G. Install hose assemblies at hose connections.

### 3.9 CONNECTIONS

- A. Install unions, in piping NPS 2 (DN 50) and smaller, adjacent to each valve and at final connection to each piece of equipment and machine.
- B. Install flanges, in piping NPS 2-1/2 (DN 65) and larger, adjacent to flanged valves and at final connection to each piece of equipment and machine.

### 3.10 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment" for seismic-restraint devices.
- B. Comply with requirements in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment" for pipe hanger and support devices.
- C. Vertical Piping: MSS Type 8 or 42, clamps.
- D. Individual, Straight, Horizontal Piping Runs:
  - 1. 100 Feet (30 m) or Less: MSS Type 1, adjustable, steel clevis hangers.
  - 2. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.
- E. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
- F. Base of Vertical Piping: MSS Type 52, spring hangers.
- G. Support horizontal piping within 12 inches (300 mm) of each fitting and coupling.
- H. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch (10-mm) minimum rods.
- I. Install hangers for Schedule 40, steel piping with the following maximum horizontal spacing and minimum rod diameters:
  - 1. NPS 1/4 to NPS 1/2 (DN 8 to DN 15): 96 inches (2400 mm) with 3/8-inch (10-mm) rod.



2. NPS 3/4 to NPS 1-1/4 (DN 20 to DN 32): 84 inches (2100 mm) with 3/8-inch (10-mm) rod.
3. NPS 1-1/2 (DN 40): 12 feet (3.7 m) with 3/8-inch (10-mm) rod.
4. NPS 2 (DN 50): 13 feet (4 m) with 3/8-inch (10-mm) rod.
5. NPS 2-1/2 (DN 65): 14 feet (4.3 m) with 1/2-inch (13-mm) rod.
6. NPS 3 (DN 80): 15 feet (4.6 m) with 1/2-inch (13-mm) rod.

- J. Install supports for vertical, Schedule 40, steel piping every 15 feet (4.6 m).

### 3.11 LABELING AND IDENTIFICATION

- A. Install identifying labels and devices for general-service compressed-air piping, valves, and specialties. Comply with requirements in Section 220553 "Identification for Plumbing Piping and Equipment."

### 3.12 FIELD QUALITY CONTROL

- A. Perform field tests and inspections.

- B. Tests and Inspections:

1. Piping Leak Tests for Metal Compressed-Air Piping: Test new and modified parts of existing piping. Cap and fill general-service compressed-air piping with oil-free dry air or gaseous nitrogen to pressure of 50 psig (345 kPa) above system operating pressure, but not less than 150 psig (1035 kPa). Isolate test source and let stand for four hours to equalize temperature. Refill system, if required, to test pressure; hold for two hours with no drop in pressure.
2. Repair leaks and retest until no leaks exist.
3. Inspect **[filters]** **[lubricators]** **[and]** **[pressure regulators]** for proper operation.

- C. Prepare test reports.

END OF SECTION 221513

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 221513 – GENERAL-SERVICE COMPRESSED-AIR PIPING

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the general-service compressed-air piping is installed and is in general conformance with the Contract Documents, applicable Codes, and shop drawings. The general-service compressed-air piping has been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

GENERAL-SERVICE COMPRESSED-AIR PIPING INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_

## SECTION 223400 - FUEL-FIRED, DOMESTIC-WATER HEATERS

## 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. Commercial, gas-fired, high-efficiency, storage, domestic-water heaters.
  - 2. Domestic-water heater accessories.

## 1.3 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Commercial domestic-water heaters shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
  - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

## 1.4 ACTION SUBMITTALS

- A. Product Data: For each type and size of domestic-water heater indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Shop Drawings:
  - 1. Wiring Diagrams: For power, signal, and control wiring.

## 1.5 INFORMATIONAL SUBMITTALS

- A. Seismic Qualification Certificates: For fuel-fired, domestic-water heaters, accessories, and components, from manufacturer.
  - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
  - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
  - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- B. Product Certificates: For each type of commercial, gas-fired, domestic-water heater, from manufacturer.
- C. Source quality-control reports.
- D. Field quality-control reports.

- E. Warranty: Sample of special warranty.

#### 1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fuel-fired, domestic-water heaters to include in emergency, operation, and maintenance manuals.

#### 1.7 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. ASHRAE/IESNA Compliance: Fabricate and label fuel-fired, domestic-water heaters to comply with ASHRAE/IESNA 90.1.
- C. ASME Compliance:
  - 1. Where ASME-code construction is indicated, fabricate and label commercial, domestic-water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
  - 2. Where ASME-code construction is indicated, fabricate and label commercial, finned-tube, domestic-water heaters to comply with ASME Boiler and Pressure Vessel Code: Section IV.
- D. NSF Compliance: Fabricate and label equipment components that will be in contact with potable water to comply with NSF 61 Annex G, "Drinking Water System Components - Health Effects."

#### 1.8 COORDINATION

- A. Coordinate sizes and locations of concrete bases with actual equipment provided.

#### 1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of fuel-fired, domestic-water heaters that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures including storage tank and supports.
    - b. Faulty operation of controls.
    - c. Deterioration of metals, metal finishes, and other materials beyond normal use.
  - 2. Warranty Periods: From date of Substantial Completion.
    - a. Commercial, Gas-Fired, Storage, Domestic-Water Heaters:
      - 1) Storage Tank: Three years.
      - 2) Controls and Other Components: One year(s).
    - b. Compression Tanks: Five years.

## PART 2 - PRODUCTS

## 2.1 COMMERCIAL, GAS-FIRED, STORAGE, DOMESTIC-WATER HEATERS

## A. Commercial, Gas-Fired, High-Efficiency, Storage, Domestic-Water Heaters:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Smith, A. O. Corporation.
  - b. Bradford White Corporation.
  - c. Lochinvar, LLC.
2. Standard: ANSI Z21.10.3/CSA 4.3.
3. Description: Manufacturer's proprietary design to provide at least 90 percent combustion efficiency at optimum operating conditions.
4. Storage-Tank Construction: ASME-code steel with 150-psig (1035-kPa) minimum working-pressure rating.
  - a. Tappings: Factory fabricated of materials compatible with tank. Attach tappings to tank before testing.
    - 1) NPS 2 (DN 50) and Smaller: Threaded ends according to ASME B1.20.1.
    - 2) NPS 2-1/2 (DN 65) and Larger: Flanged ends according to ASME B16.5 for steel and stainless-steel flanges and according to ASME B16.24 for copper and copper-alloy flanges.
  - b. Interior Finish: Comply with NSF 61 Annex G barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
  - c. Lining: Glass complying with NSF 61 Annex G barrier materials for potable-water tank linings, including extending lining into and through tank fittings and outlets.
5. Factory-Installed Storage-Tank Appurtenances:
  - a. Anode Rod: Replaceable magnesium.
  - b. Dip Tube: Required unless cold-water inlet is near bottom of tank.
  - c. Drain Valve: Corrosion-resistant metal complying with ASSE 1005.
  - d. Insulation: Comply with ASHRAE/IESNA 90.1. Surround entire storage tank except connections and controls.
  - e. Jacket: Steel with enameled finish.
  - f. Burner or Heat Exchanger: Comply with UL 795 or approved testing agency requirements for gas-fired, high-efficiency, domestic-water heaters and natural-gas fuel.
  - g. Temperature Control: Adjustable thermostat.
  - h. Safety Controls: Automatic, high-temperature-limit and low-water cutoff devices or systems.
  - i. Combination Temperature-and-Pressure Relief Valves: ANSI Z21.22/CSA 4.4-M. Include one or more relief valves with total relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select one relief valve with sensing element that extends into storage tank.

## 2.2 DOMESTIC-WATER HEATER ACCESSORIES

## A. Domestic-Water Compression Tanks:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. AMTROL, Inc.
  - b. Smith, A. O. Corporation.
2. Description: Steel, pressure-rated tank constructed with welded joints and factory-installed butyl-rubber diaphragm. Include air precharge to minimum system-operating pressure at tank.

3. Construction:
  - a. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1 pipe thread.
  - b. Interior Finish: Comply with NSF 61 Annex G barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
  - c. Air-Charging Valve: Factory installed.
- B. Drain Pans: Corrosion-resistant metal with raised edge. Comply with ANSI/CSA LC 3. Include dimensions not less than base of domestic-water heater, and include drain outlet not less than NPS 3/4 (DN 20) with ASME B1.20.1 pipe threads or with ASME B1.20.7 garden-hose threads.
- C. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE/IESNA 90.1 or ASHRAE 90.2.
- D. Heat-Trap Fittings: ASHRAE 90.2.
- E. Comply with requirements for ball-, butterfly-, or gate-type shutoff valves specified in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.13 "Butterfly Valves for Plumbing Piping," and Section 220523.15 "Gate Valves for Plumbing Piping."
  1. Comply with requirements for balancing valves specified in Section 221119 "Domestic Water Piping Specialties."
- F. Gas Shutoff Valves: ANSI Z21.15/CSA 9.1-M, manually operated. Furnish for installation in piping.

## 2.3 SOURCE QUALITY CONTROL

- A. Factory Tests: Test and inspect assembled domestic-water heaters and storage tanks specified to be ASME-code construction, according to ASME Boiler and Pressure Vessel Code.
- B. Hydrostatically test commercial domestic-water heaters to minimum of one and one-half times pressure rating before shipment.
- C. Domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Section 014000 "Quality Requirements" for retesting and reinspecting requirements and Section 017300 "Execution" for requirements for correcting the Work.
- D. Prepare test and inspection reports.

## PART 3 - EXECUTION

### 3.1 DOMESTIC-WATER HEATER INSTALLATION

- A. Commercial, Domestic-Water Heater Mounting: Install commercial domestic-water heaters on concrete base. Comply with requirements for concrete base specified in Section 033160 "Miscellaneous Concrete Work."
  1. Exception: Omit concrete bases for commercial domestic-water heaters if installation on stand, bracket, suspended platform, or directly on floor is indicated.
  2. Maintain manufacturer's recommended clearances.
  3. Arrange units so controls and devices that require servicing are accessible.

4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of concrete base.
  5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
  6. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  7. Install anchor bolts to elevations required for proper attachment to supported equipment.
  8. Anchor domestic-water heaters to substrate.
- B. Residential, Domestic-Water Heater Mounting: Install residential domestic-water heaters on water-heater stand on floor.
1. Maintain manufacturer's recommended clearances.
  2. Arrange units so controls and devices that require servicing are accessible.
  3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  4. Install anchor bolts to elevations required for proper attachment to supported equipment.
  5. Anchor domestic-water heaters to substrate.
- C. Install domestic-water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.
1. Install shutoff valves on domestic-water-supply piping to domestic-water heaters and on domestic-hot-water outlet piping. Comply with requirements for shutoff valves specified in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.13 "Butterfly Valves for Plumbing Piping," and Section 220523.15 "Gate Valves for Plumbing Piping."
- D. Install gas-fired, domestic-water heaters according to NFPA 54.
1. Install gas shutoff valves on gas supply piping to gas-fired, domestic-water heaters without shutoff valves.
  2. Comply with requirements for gas shutoff valves, gas pressure regulators, and automatic gas valves specified in Section 231123 "Facility Natural-Gas Piping."
- E. Install commercial domestic-water heaters with seismic-restraint devices. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- F. Install combination temperature-and-pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.
- G. Install water-heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for domestic-water heaters that do not have tank drains. Comply with requirements for hose-end drain valves specified in Section 221119 "Domestic Water Piping Specialties."
- H. Install thermometer on outlet piping of domestic-water heaters. Comply with requirements for thermometers specified in Section 220519 "Meters and Gages for Plumbing Piping."
- I. Install piping-type heat traps on inlet and outlet piping of domestic-water heater storage tanks without integral or fitting-type heat traps.
- J. Fill domestic-water heaters with water.

- K. Charge domestic-water compression tanks with air.

### 3.2 CONNECTIONS

- A. Comply with requirements for domestic-water piping specified in Section 221116 "Domestic Water Piping."
- B. Comply with requirements for gas piping specified in Section 231123 "Facility Natural-Gas Piping."
- C. Drawings indicate general arrangement of piping, fittings, and specialties.
- D. Where installing piping adjacent to fuel-fired, domestic-water heaters, allow space for service and maintenance of water heaters. Arrange piping for easy removal of domestic-water heaters.

### 3.3 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

### 3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
  - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
  - 2. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation.
  - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Section 014000 "Quality Requirements" for retesting and reinspecting requirements and Section 017300 "Execution" for requirements for correcting the Work.
- C. Prepare test and inspection reports.

END OF SECTION 223400



CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 223400 – FUEL-FIRED, DOMESTIC-WATER HEATERS

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the fuel-fired, domestic-water heaters are installed and are in general conformance with the Contract Documents, applicable Codes, and shop drawings. The fuel-fired, domestic-water heaters have been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

FUEL-FIRED, DOMESTIC-WATER HEATER INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_



## SECTION 224213.13 - COMMERCIAL WATER CLOSETS

## 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. Water closets.
  - 2. Flushometer valves.
  - 3. Toilet seats.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for water closets.
  - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

## PART 2 - PRODUCTS

## 2.1 FLOOR-MOUNTED, BOTTOM-OUTLET WATER CLOSETS

- A. Water Closets: Floor mounted, bottom outlet, tank type.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. American Standard America.
    - b. Crane Plumbing, L.L.C.
    - c. Kohler Co.
  - 2. Bowl:
    - a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.
    - b. Material: Vitreous china.
    - c. Type: Pressure assisted Siphon jet.
    - d. Style: tank.
    - e. Height: Handicapped/elderly, complying with ICC/ANSI A117.1.
    - f. Rim Contour: Elongated.
    - g. Water Consumption: 1.6 gal. (6 L) per flush.
    - h. Color: White.
  - 3. Bowl-to-Drain Connecting Fitting: ASTM A 1045 or ASME A112.4.3.

## 2.2 TOILET SEATS

- A. Toilet Seats:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. American Standard America.
    - b. Bemis Manufacturing Company.
    - c. Centoco Manufacturing Corporation.
    - d. Church Seats; Bemis Manufacturing Company.
    - e. Kohler Co.
    - f. Olsonite Seat Co.
  - 2. Standard: IAPMO/ANSI Z124.5.
  - 3. Material: Plastic.
  - 4. Type: Commercial (Heavy duty).
  - 5. Shape: Elongated rim, open front.
  - 6. Hinge: Self-sustaining, check.
  - 7. Hinge Material: Noncorroding metal.
  - 8. Seat Cover: Not required.
  - 9. Color: White.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before water-closet installation.
- B. Examine walls and floors for suitable conditions where water closets will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Water-Closet Installation:
  - 1. Install level and plumb according to roughing-in drawings.
  - 2. Install floor-mounted water closets on bowl-to-drain connecting fitting attachments to piping or building substrate.
- B. Support Installation:
  - 1. Install supports, affixed to building substrate, for floor-mounted, back-outlet water closets.
- C. Install toilet seats on water closets.
- D. Wall Flange and Escutcheon Installation:
  - 1. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations and within cabinets and millwork.
  - 2. Install deep-pattern escutcheons if required to conceal protruding fittings.
  - 3. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."
- E. Joint Sealing:

1. Seal joints between water closets and walls and floors using sanitary-type, one-part, mildew-resistant silicone sealant.
2. Match sealant color to water-closet color.
3. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

### 3.3 CONNECTIONS

- A. Connect water closets with water supplies and soil, waste, and vent piping. Use size fittings required to match water closets.
- B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."
- C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."
- D. Where installing piping adjacent to water closets, allow space for service and maintenance.

### 3.4 ADJUSTING

- A. Operate and adjust water closets and controls. Replace damaged and malfunctioning water closets, fittings, and controls.

### 3.5 CLEANING AND PROTECTION

- A. Clean water closets and fittings with manufacturers' recommended cleaning methods and materials.
- B. Install protective covering for installed water closets and fittings.
- C. Do not allow use of water closets for temporary facilities unless approved in writing by Owner.

END OF SECTION 224213.13

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 224213.13 – COMMERCIAL WATER CLOSETS

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the commercial water closets are installed and are in general conformance with the Contract Documents, applicable Codes, and shop drawings. The commercial water closets have been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

COMMERCIAL WATER CLOSET INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_

## SECTION 224213.16 - COMMERCIAL URINALS

## 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. Urinals.
  - 2. Flushometer valves.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for urinals.
  - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

## 1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For flushometer valves to include in operation and maintenance manuals.

## 1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Flushometer-Valve Repair Kits: Equal to 10 percent of amount of each type installed, but no fewer than one of each type.

## PART 2 - PRODUCTS

## 2.1 WALL-HUNG URINALS

- A. Urinals: Wall hung, back outlet, washout.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. American Standard America.
    - b. Crane Plumbing, L.L.C.
    - c. Kohler Co.
    - d. Zurn Industries, LLC.

2. Fixture:
  - a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.
  - b. Material: Vitreous china.
  - c. Type: Washout with extended shields.
  - d. Strainer or Trapway: Manufacturer's standard strainer with integral trap.
  - e. Water Consumption: Low.
  - f. Spud Size and Location: NPS 3/4 (DN 20), top.
  - g. Outlet Size and Location: NPS 2 (DN 50), back.
  - h. Color: White.
3. Waste Fitting:
  - a. Standard: ASME A112.18.2/CSA B125.2 for coupling.
  - b. Size: NPS 2 (DN 50).
4. Support: ASME A112.6.1M, Type I, urinal carrier with fixture support plates and coupling with seal and fixture bolts and hardware matching fixture. Include rectangular, steel uprights.

## 2.2 URINAL FLUSHOMETER VALVES

- A. Lever-Handle, Diaphragm Flushometer Valves:
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Sloan Valve Company.
    - b. Zurn Industries, LLC.
  2. Standard: ASSE 1037.
  3. Minimum Pressure Rating: 125 psig (860 kPa).
  4. Features: Include integral check stop and backflow-prevention device.
  5. Material: Brass body with corrosion-resistant components.
  6. Exposed Flushometer-Valve Finish: Chrome plated.
  7. Panel Finish: Chrome plated or stainless steel.
  8. Style: Exposed.
  9. Consumption: 1.0 gal. (3.8 L) per flush.
  10. Minimum Inlet: NPS 3/4 (DN 20).
  11. Minimum Outlet: NPS 1-1/4 (DN 32).

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before urinal installation.
- B. Examine walls and floors for suitable conditions where urinals will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Urinal Installation:
  1. Install urinals level and plumb according to roughing-in drawings.
  2. Install wall-hung, back-outlet urinals onto waste fitting seals and attached to supports.



3. Install accessible, wall-mounted urinals at mounting height for the handicapped/elderly, according to ICC/ANSI A117.1.
- B. Support Installation:
  1. Install supports, affixed to building substrate, for wall-hung urinals.
  2. Use off-floor carriers with waste fitting and seal for back-outlet urinals.
  3. Use carriers without waste fitting for urinals with tubular waste piping.
  4. Use chair-type carrier supports with rectangular steel uprights for accessible urinals.
- C. Flushometer-Valve Installation:
  1. Install flushometer-valve water-supply fitting on each supply to each urinal.
  2. Attach supply piping to supports or substrate within pipe spaces behind fixtures.
  3. Install lever-handle flushometer valves for accessible urinals with handle mounted on open side of compartment.
- D. Wall Flange and Escutcheon Installation:
  1. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations.
  2. Install deep-pattern escutcheons if required to conceal protruding fittings.
  3. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."
- E. Joint Sealing:
  1. Seal joints between urinals and walls and floors using sanitary-type, one-part, mildew-resistant silicone sealant.
  2. Match sealant color to urinal color.
  3. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

### 3.3 CONNECTIONS

- A. Connect urinals with water supplies and soil, waste, and vent piping. Use size fittings required to match urinals.
- B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."
- C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."
- D. Where installing piping adjacent to urinals, allow space for service and maintenance.

### 3.4 ADJUSTING

- A. Operate and adjust urinals and controls. Replace damaged and malfunctioning urinals, fittings, and controls.
- B. Adjust water pressure at flushometer valves to produce proper flow.

### 3.5 CLEANING AND PROTECTION

- A. Clean urinals and fittings with manufacturers' recommended cleaning methods and materials.
- B. Install protective covering for installed urinals and fittings.

- C. Do not allow use of urinals for temporary facilities unless approved in writing by Owner.

END OF SECTION 224213.16

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 224213.16 – COMMERCIAL URINALS

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the commercial urinals are installed and are in general conformance with the Contract Documents, applicable Codes, and shop drawings. The commercial urinals have been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

COMMERCIAL URINAL INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_



## SECTION 224216.13 - COMMERCIAL LAVATORIES

## 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. Lavatories.
  - 2. Faucets.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for lavatories.
  - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Shop Drawings: Include diagrams for power, signal, and control wiring of automatic faucets.

## 1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Counter cutout templates for mounting of counter-mounted lavatories.

## 1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For lavatories and faucets to include in operation and maintenance manuals.
  - 1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
    - a. Servicing and adjustments of automatic faucets.

## 1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Faucet Washers and O-Rings: Equal to 10 percent of amount of each type and size installed.
  - 2. Faucet Cartridges and O-Rings: Equal to 5 percent of amount of each type and size installed.

## PART 2 - PRODUCTS

## 2.1 VITREOUS-CHINA, COUNTER-MOUNTED LAVATORIES

- A. Lavatory: Rectangular, self-rimming, vitreous china, counter mounted.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. American Standard America.
    - b. Crane Plumbing, L.L.C.
    - c. Kohler Co.
  - 2. Fixture:
    - a. Standard: ASME A112.19.2/CSA B45.1.
    - b. Type: Self-rimming for above-counter mounting.
    - c. Nominal Size: Rectangular, 21 by 19 inches (533 by 483 mm).
    - d. Faucet-Hole Punching: Three holes, 2-inch (51-mm) centers.
    - e. Faucet-Hole Location: Top.
    - f. Color: White.
    - g. Mounting Material: Sealant.

## 2.2 VITREOUS-CHINA, WALL-MOUNTED LAVATORIES

- A. Lavatory: Vitreous china, wall mounted, with back.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. American Standard America.
    - b. Crane Plumbing, L.L.C.
    - c. Kohler Co.
    - d. Zurn Industries, LLC.
  - 2. Fixture:
    - a. Standard: ASME A112.19.2/CSA B45.1.
    - b. Type: For wall hanging.
    - c. Nominal Size: Oval, 19 by 16 inches (483 by 406 mm).
    - d. Faucet-Hole Punching: Three holes, 2-inch (51-mm) centers.
    - e. Faucet-Hole Location: Top.
    - f. Color: White.
    - g. Mounting Material: Chair carrier.
  - 3. Support: ASME A112.6.1M, Type II, concealed-arm lavatory carrier. Include rectangular, steel uprights.

## 2.3 SOLID-BRASS, MANUALLY OPERATED FAUCETS

- A. NSF Standard: Comply with NSF/ANSI 61 Annex G, "Drinking Water System Components - Health Effects," for faucet materials that will be in contact with potable water.
- B. Lavatory Faucets: Manual-type, two-handle mixing, commercial, solid-brass valve.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. American Standard America.
    - b. Chicago Faucets; Geberit Company.
    - c. Elkay Manufacturing Co.
    - d. Kohler Co.
  - 2. Standard: ASME A112.18.1/CSA B125.1.

3. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and fixture receptor.
4. Body Type: Centerset.
5. Body Material: Commercial, solid brass.
6. Finish: Polished chrome plate.
7. Maximum Flow Rate: 0.5 gpm (1.5 L/min.).
8. Mounting Type: Deck, exposed.
9. Valve Handle(s): Wrist blade, 4 inches (102 mm).
10. Spout: Rigid type.
11. Spout Outlet: Aerator.
12. Operation: Compression, manual.
13. Drain: Not part of faucet.

## 2.4 SUPPLY FITTINGS

- A. NSF Standard: Comply with NSF/ANSI 61 Annex G, "Drinking Water System Components - Health Effects," for supply-fitting materials that will be in contact with potable water.
- B. Standard: ASME A112.18.1/CSA B125.1.
- C. Supply Piping: Chrome-plated-brass pipe or chrome-plated copper tube matching water-supply piping size. Include chrome-plated-brass or stainless-steel wall flange.
- D. Supply Stops: Chrome-plated-brass, one-quarter-turn, ball-type or compression valve with inlet connection matching supply piping.
- E. Operation: Loose key.
- F. Risers:
  1. NPS 1/2 (DN 15).
  2. ASME A112.18.6, braided- or corrugated-stainless-steel, flexible hose riser.

## 2.5 WASTE FITTINGS

- A. Standard: ASME A112.18.2/CSA B125.2.
- B. Drain: Grid type with NPS 1-1/4 (DN 32) offset and straight tailpiece.
- C. Trap:
  1. Size: NPS 1-1/2 by NPS 1-1/4 (DN 40 by DN 32).
  2. Material: Chrome-plated, two-piece, cast-brass trap and swivel elbow with 0.032-inch- (0.83-mm-) thick brass tube to wall or one-piece, cast-brass trap with swivel 0.029-inch- (73-mm-) thick tubular brass wall bend; and chrome-plated, brass or steel wall flange.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before lavatory installation.

- B. Examine counters and walls for suitable conditions where lavatories will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Install lavatories level and plumb according to roughing-in drawings.
- B. Install supports, affixed to building substrate, for wall-mounted lavatories.
- C. Install accessible wall-mounted lavatories at handicapped/elderly mounting height for people with disabilities or the elderly, according to ICC/ANSI A117.1.
- D. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."
- E. Seal joints between lavatories, counters, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."
- F. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories. Comply with requirements in Section 220719 "Plumbing Piping Insulation."

### 3.3 CONNECTIONS

- A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.
- B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."
- C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

### 3.4 ADJUSTING

- A. Operate and adjust lavatories and controls. Replace damaged and malfunctioning lavatories, fittings, and controls.
- B. Adjust water pressure at faucets to produce proper flow.
- C. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

### 3.5 CLEANING AND PROTECTION

- A. After completing installation of lavatories, inspect and repair damaged finishes.
- B. Clean lavatories, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.



- C. Provide protective covering for installed lavatories and fittings.
- D. Do not allow use of lavatories for temporary facilities unless approved in writing by Owner.

END OF SECTION 224216.13

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 224216.13 – COMMERCIAL LAVATORIES

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the commercial lavatories are installed and are in general conformance with the Contract Documents, applicable Codes, and shop drawings. The commercial lavatories have been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

COMMERCIAL LAVATORY INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_

## SECTION 224216.16 - COMMERCIAL SINKS

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Service basins.
  - 2. Utility sinks.
  - 3. Sink faucets.
  - 4. Laminar-flow, faucet-spout outlets.
  - 5. Supply fittings.
  - 6. Waste fittings.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for sinks.
  - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

## 1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Counter cutout templates for mounting of counter-mounted lavatories.

## 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For sinks to include in maintenance manuals.

## 1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Faucet Washers and O-Rings: Equal to 10 percent of amount of each type and size installed.
  - 2. Faucet Cartridges and O-Rings: Equal to 5 percent of amount of each type and size installed.

## PART 2 - PRODUCTS

## 2.1 SERVICE BASINS

- A. Service Basins: Terrazzo, floor mounted.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. Stern-Williams Co., Inc.
  - 2. Fixture:
    - a. Standard: IAPMO PS 99.
    - b. Shape: Square.
    - c. Nominal Size: 24 by 24 inches (610 by 610 mm).
    - d. Height: 12 inches (305 mm).
    - e. Rim Guard: On front top surfaces.
    - f. Drain: Grid with NPS 3 (DN 80) outlet.
  - 3. Mounting: On floor and flush to wall.

## 2.2 UTILITY SINKS

- A. Utility Sinks: molded stone, freestanding.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. Just Manufacturing.
  - 2. Fixture:
    - a. Standard: ASME A112.19.3/CSA B45.4.
    - b. Number of Compartments: One.
    - c. Overall Dimensions: 23" x 21-1/2".
    - d. Compartment:
      - 1) Drain: Grid with NPS 1-1/2 (DN 40) tailpiece and twist drain.
      - 2) Drain Location: Centered in compartment.
  - 3. Supply Fittings:
    - a. Standard: ASME A112.18.1/CSA B125.1.
    - b. Supplies: Chrome-plated brass compression stop with inlet connection matching water-supply piping type and size.
      - 1) Operation: Loose key.
      - 2) Risers: NPS 1/2 (DN 15), ASME A112.18.6, braided or corrugated stainless-steel flexible hose.
  - 4. Waste Fittings:
    - a. Standard: ASME A112.18.2/CSA B125.2.
    - b. Trap(s):
      - 1) Size: NPS 1-1/2 (DN 40).
      - 2) Material: Chrome-plated, two-piece, cast-brass trap and swivel elbow with 0.032-inch- (0.83-mm-) thick brass tube to wall; and chrome-plated brass or steel wall flange.

## 2.3 SINK FAUCETS

- A. NSF Standard: Comply with NSF/ANSI 61 Annex G, "Drinking Water System Components - Health Effects," for faucet-spout materials that will be in contact with potable water.
- B. Sink Faucets: Manual type, two-lever-handle mixing valve.
  - 1. Commercial, Solid-Brass Faucets.

- a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1) American Standard America.
  - 2) Chicago Faucets; Geberit Company.
  - 3) Elkay Manufacturing Co.
  - 4) Kohler Co.
  - 5) Zurn Industries, LLC.

## 2.4 SUPPLY FITTINGS

- A. NSF Standard: Comply with NSF/ANSI 61 Annex G, "Drinking Water System Components - Health Effects," for supply-fitting materials that will be in contact with potable water.
- B. Standard: ASME A112.18.1/CSA B125.1.
- C. Supply Piping: Chrome-plated brass pipe or chrome-plated copper tube matching water-supply piping size. Include chrome-plated brass or stainless-steel wall flange.
- D. Supply Stops: Chrome-plated brass, one-quarter-turn, ball-type or compression valve with inlet connection matching supply piping.
- E. Operation: Loose key.
- F. Risers:
  - 1. NPS 3/8 (DN 10)
  - 2. ASME A112.18.6, braided or corrugated stainless-steel flexible hose.

## 2.5 WASTE FITTINGS

- A. Standard: ASME A112.18.2/CSA B125.2.
- B. Drain: Grid type with NPS 1-1/2 (DN 40) offset and straight tailpiece.
- C. Trap:
  - 1. Size: NPS 1-1/2 (DN 40).
  - 2. Material: Chrome-plated, two-piece, cast-brass trap and swivel elbow with 0.032-inch- (0.83-mm-) thick brass tube to wall or one-piece, cast-brass trap with swivel 0.029-inch- (73-mm-) thick tubular brass wall bend; and chrome-plated brass or steel wall flange.

## 2.6 GROUT

- A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Nonshrink; recommended for interior and exterior applications.
- C. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

## PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before sink installation.
- B. Examine walls, floors, and counters for suitable conditions where sinks will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 INSTALLATION

- A. Install sinks level and plumb according to roughing-in drawings.
- B. Install supports, affixed to building substrate, for wall-hung sinks.
- C. Install accessible wall-mounted sinks at handicapped/elderly mounting height according to ICC/ANSI A117.1.
- D. Set floor-mounted sinks in leveling bed of cement grout.
- E. Install water-supply piping with stop on each supply to each sink faucet.
  - 1. Exception: Use ball or gate valves if supply stops are not specified with sink. Comply with valve requirements specified in Section 220523.12 "Ball Valves for Plumbing Piping" and Section 220523.15 "Gate Valves for Plumbing Piping."
  - 2. Install stops in locations where they can be easily reached for operation.
- F. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."
- G. Seal joints between sinks and counters, floors, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."
- H. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible sinks. Comply with requirements in Section 220719 "Plumbing Piping Insulation."

## 3.3 CONNECTIONS

- A. Connect sinks with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.
- B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."
- C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

3.4 ADJUSTING

- A. Operate and adjust sinks and controls. Replace damaged and malfunctioning sinks, fittings, and controls.
- B. Adjust water pressure at faucets to produce proper flow.

3.5 CLEANING AND PROTECTION

- A. After completing installation of sinks, inspect and repair damaged finishes.
- B. Clean sinks, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.
- C. Provide protective covering for installed sinks and fittings.
- D. Do not allow use of sinks for temporary facilities unless approved in writing by Owner.

END OF SECTION 224216.16

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 224216.16 – COMMERCIAL SINKS

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the commercial sinks are installed and are in general conformance with the Contract Documents, applicable Codes, and shop drawings. The commercial sinks have been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

COMMERCIAL SINK INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_



## SECTION 224500 - EMERGENCY PLUMBING FIXTURES

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Eyewash equipment.
  - 2. Eye/face wash equipment.
  - 3. Combination units.
  - 4. Supplemental equipment.
  - 5. Water-tempering equipment.

## 1.3 DEFINITIONS

- A. Accessible Fixture: Emergency plumbing fixture that can be approached, entered, and used by people with disabilities.
- B. Plumbed Emergency Plumbing Fixture: Fixture with fixed, potable-water supply.
- C. Self-Contained Emergency Plumbing Fixture: Fixture with flushing-fluid-solution supply.
- D. Tepid: Moderately warm.

## 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include flow rates and capacities, furnished specialties, and accessories.

## 1.5 INFORMATIONAL SUBMITTALS

- A. Field quality-control test reports.

## 1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For emergency plumbing fixtures to include in operation and maintenance manuals.

## 1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Flushing-Fluid Solution: Separate lot and equal to at least **[200]** <Insert number> percent of amount of solution installed for each self-contained unit.

## 1.8 QUALITY ASSURANCE

- A. ANSI Standard: Comply with ANSI Z358.1, "Emergency Eyewash and Shower Equipment."
- B. NSF Standard: Comply with NSF 61 Annex G, "Drinking Water System Components - Health Effects," for fixture materials that will be in contact with potable water.

## PART 2 - PRODUCTS

### 2.1 EYEWASH EQUIPMENT

- A. Wall-Mounted, Plumbed Eyewash Units,:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Acorn Safety.
    - b. Bradley Corporation.
    - c. Encon Safety Products.
    - d. Guardian Equipment Co.
    - e. Haws Corporation.
    - f. Speakman Company.
  - 2. Capacity: Not less than 0.4 gpm (1.5 L/min.) for at least 15 minutes.
  - 3. Supply Piping: NPS 1/2 (DN 15) chrome-plated brass or stainless steel with flow regulator and stay-open control valve.
  - 4. Control-Valve Actuator: Paddle.
  - 5. Spray-Head Assembly: Two receptor-mounted spray heads.
  - 6. Receptor: Chrome-plated brass or stainless-steel bowl.
  - 7. Drain Piping: NPS 1-1/4 (DN 32) minimum, chrome-plated brass, receptor drain, P-trap, waste to wall, and wall flange complying with ASME A112.18.2/CSA B125.2.
  - 8. Mounting: Wall bracket.

### 2.2 EYE/FACE WASH EQUIPMENT

- A. Standard, Wall-Mounted, Plumbed, Eye/Face Wash Units,:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Acorn Safety.
    - b. Bradley Corporation.
    - c. Encon Safety Products.
    - d. Guardian Equipment Co.
    - e. Haws Corporation.
    - f. Speakman Company.
  - 2. Capacity: Not less than 3.0 gpm (11.4 L/min.) for at least 15 minutes.

3. Supply Piping: NPS 1/2 (DN 15) chrome-plated brass or stainless steel with flow regulator and stay-open control valve.
4. Control-Valve Actuator: Paddle.
5. Spray-Head Assembly: Two or four receptor-mounted spray heads.
6. Receptor: Chrome-plated brass or stainless-steel bowl.
7. Drain Piping: NPS 1-1/4 (DN 32) minimum, chrome-plated brass, receptor drain, P-trap, waste to wall, and wall flange complying with ASME A112.18.2/CSA B125.2.
8. Mounting: Wall bracket.

## 2.3 WATER-TEMPERING EQUIPMENT

- A. Hot- and Cold-Water, Water-Tempering Equipment,:
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Acorn Safety.
    - b. Armstrong International, Inc.
    - c. Bradley Corporation.
    - d. Encon Safety Products.
    - e. Haws Corporation.
    - f. Lawler Manufacturing Company, Inc.
    - g. Leonard Valve Company.
    - h. Powers.
    - i. Speakman Company.
  2. Description: Factory-fabricated equipment with thermostatic mixing valve.
    - a. Thermostatic Mixing Valve: Designed to provide 85 deg F (29 deg C) tepid, potable water at emergency plumbing fixtures, to maintain temperature at plus or minus 5 deg F (3 deg C) throughout required 15-minute test period, and in case of unit failure to continue cold-water flow, with union connections, controls, metal piping, and corrosion-resistant enclosure.
    - b. Supply Connections: For hot and cold water.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine roughing-in for water and waste piping systems to verify actual locations of piping connections before plumbed emergency plumbing fixture installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 EMERGENCY PLUMBING FIXTURE INSTALLATION

- A. Assemble emergency plumbing fixture piping, fittings, control valves, and other components.
- B. Install fixtures level and plumb.
- C. Fasten fixtures to substrate.

### 3.3 CONNECTIONS

- A. Connect cold-water-supply piping to plumbed emergency plumbing fixtures not having water-tempering equipment. Comply with requirements for cold-water piping specified in Section 221116 "Domestic Water Piping."
- B. Connect hot- and cold-water-supply piping to hot- and cold-water, water-tempering equipment. Connect output from water-tempering equipment to emergency plumbing fixtures. Comply with requirements for hot- and cold-water piping specified in Section 221116 "Domestic Water Piping."
- C. Connect cold water and electrical power to electric heating water-tempering equipment. Comply Directly connect emergency plumbing fixture receptors with trapped drain outlet to sanitary waste and vent piping. Comply with requirements for waste piping specified in Section 221316 "Sanitary Waste and Vent Piping."
- D. Where installing piping adjacent to emergency plumbing fixtures, allow space for service and maintenance of fixtures.

### 3.4 IDENTIFICATION

- A. Install equipment nameplates or equipment markers on emergency plumbing fixtures and equipment and equipment signs on water-tempering equipment. Comply with requirements for identification materials specified in Section 220553 "Identification for Plumbing Piping and Equipment."

### 3.5 FIELD QUALITY CONTROL

- A. Mechanical-Component Testing: After plumbing connections have been made, test for compliance with requirements. Verify ability to achieve indicated capacities.
- B. Tests and Inspections:
  - 1. Perform each visual and mechanical inspection.
  - 2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
  - 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation.
  - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Emergency plumbing fixtures and water-tempering equipment will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

### 3.6 ADJUSTING

- A. Adjust or replace fixture flow regulators for proper flow.
- B. Adjust equipment temperature settings.

END OF SECTION 224500

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 224500 – EMERGENCY PLUMBING FIXTURES

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the emergency plumbing fixtures are installed and are in general conformance with the Contract Documents, applicable Codes, and shop drawings. The emergency plumbing fixtures have been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

EMERGENCY PLUMBING FIXTURE INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_

## SECTION 224716 - PRESSURE WATER COOLERS

## 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 pressure water coolers and related components.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of pressure water cooler.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
  - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Shop Drawings: Include diagrams for power, signal, and control wiring.

## 1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For pressure water coolers to include in maintenance manuals.

## 1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Filter Cartridges: Equal to 1 percent of each installed.

## PART 2 - PRODUCTS

## 2.1 PRESSURE WATER COOLERS

- A. Pressure Water Coolers: Wall mounted.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Elkay Manufacturing Co.
    - b. Halsey Taylor.
    - c. Haws Corporation.
    - d. Oasis
  - 2. Cabinet: Single, **[vinyl-covered steel with stainless-steel top]**.
  - 3. Bubbler: One, with adjustable stream regulator, located on each cabinet deck.

## PRESSURE WATER COOLERS

4. Control: Push bar.
5. Drain: Grid with NPS 1-1/4 (DN 32) tailpiece.
6. Supply: NPS 3/8 (DN 10) with shutoff valve.
7. Waste Fitting: ASME A112.18.2/CSA B125.2, NPS 1-1/4 (DN 32) brass P-trap.  
Filter: One or more water filters complying with NSF 42 and NSF 53 for cyst and lead reduction to below EPA standards; with capacity sized for unit peak flow rate.
8. Cooling System: Electric, with hermetically sealed compressor, cooling coil, air-cooled condensing unit, corrosion-resistant tubing, refrigerant, corrosion-resistant-metal storage tank, and adjustable thermostat.
  - a. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
9. Capacities and Characteristics:
  - a. Cooled Water: 8 gph (0.0084 L/s).
  - b. Ambient-Air Temperature: 90 deg F (32 deg C).
  - c. Inlet-Water Temperature: 80 deg F (27 deg C).
  - d. Cooled-Water Temperature: 50 deg F (10 deg C).
  - e. Electrical Characteristics:
    - 1) Volts: 120-V ac.
    - 2) Phase: Single.
    - 3) Hertz: 60.
10. Support: ASME A112.6.1M, Type I water-cooler carrier.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine roughing-in for water-supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before fixture installation.
- B. Examine walls and floors for suitable conditions where fixtures will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Install fixtures level and plumb according to roughing-in drawings. For fixtures indicated for children, install at height required by authorities having jurisdiction.
- B. Set freestanding pressure water coolers on floor.
- C. Install off-the-floor carrier supports, affixed to building substrate, for wall-mounted fixtures.
- D. Install mounting frames, affixed to building construction, and attach recessed, pressure water coolers to mounting frames.
- E. Install water-supply piping with shutoff valve on supply to each fixture to be connected to domestic-water distribution piping. Use ball or gate valve. Install valves in locations where they can be easily reached for operation. Valves are specified in Section 220523.12 "Ball Valves for Plumbing Piping" and Section 220523.15 "Gate Valves for Plumbing Piping."



- F. Install trap and waste piping on drain outlet of each fixture to be connected to sanitary drainage system.
- G. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons where required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."
- H. Seal joints between fixtures and walls using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

### 3.3 CONNECTIONS

- A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.
- B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."
- C. Install ball or gate shutoff valve on water supply to each fixture. Install valve upstream from filter for water cooler. Comply with valve requirements specified in Section 220523.12 "Ball Valves for Plumbing Piping" and Section 220523.15 "Gate Valves for Plumbing Piping."
- D. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

### 3.4 ADJUSTING

- A. Adjust fixture flow regulators for proper flow and stream height.
- B. Adjust pressure water-cooler temperature settings.

### 3.5 CLEANING

- A. After installing fixture, inspect unit. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.
- B. Clean fixtures, on completion of installation, according to manufacturer's written instructions.
- C. Provide protective covering for installed fixtures.
- D. Do not allow use of fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 224716

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 224716 – PRESSURE WATER COOLERS

Project Location: \_\_\_\_

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

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

## Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the pressure water coolers are installed and are in general conformance with the Contract Documents, applicable Codes, and shop drawings. The pressure water coolers have been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

## PRESSURE WATER COOLER INSTALLER:

\_\_\_\_\_  
(Subcontractor Signature)\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

## CONTRACTOR:

\_\_\_\_\_  
(Contractor Signature)\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_

## SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

## 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. Equipment labels.
  - 2. Pipe labels.
  - 3. Duct labels.
  - 4. Stencils.

## 1.3 ACTION SUBMITTALS

- A. Valve numbering scheme and Schedule 1: valve chart & schedule, including valve tag number & location.

## PART 2 - PRODUCTS

## 2.1 EQUIPMENT LABELS

- A. Metal Labels for Equipment:
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Brady Corporation.
  - 2. Material and Thickness: Brass, 0.032-inch (0.8-mm) minimum thickness, and having predrilled or stamped holes for attachment hardware.
  - 3. Lettering: Stamped.
  - 4. Minimum Label Size: 1 – ½ inch diameter.
  - 5. Minimum Letter Size: 1/4 inch Fasteners: Stainless-steel **[rivets] [or] [self-tapping screws]**.
- B. Plastic Labels for Equipment:
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Brady Corporation.
  - 2. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
  - 3. Letter Color: Black.
  - 4. Background Color: White.
  - 5. Minimum Label Size: 1-1/2 inch diameter.

6. Minimum Letter Size: 1/4 inch

- C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number. Equipment schedule shall be included in operation and maintenance data.

## 2.2 PIPE LABELS

- 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. Brady Corporation.
- B. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction according to ASME A13.1.
- C. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.
- D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; also include pipe size and an arrow indicating flow direction.
1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.

## 2.3 STENCILS

- A. Stencils for Ducts:
1. Lettering Size: Minimum letter height of 2-1/2 inches.
  2. Stencil Paint: Exterior, gloss, acrylic enamel. Paint may be in pressurized spray-can form.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

### 3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with locations of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

### 3.3 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

### 3.4 PIPE LABEL INSTALLATION

- A. Stenciled Pipe Label Option: Stenciled labels may be provided instead of manufactured pipe labels, at Installer's option. Install stenciled pipe labels, complying with ASME A13.1, with painted, color-coded bands or rectangles on each piping system.
  - 1. Identification Paint: Use for contrasting background.
  - 2. Stencil Paint: Use for pipe marking.
- B. Pipe Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
  - 1. Near each valve and control device.
  - 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
  - 3. Near penetrations and on both sides of through walls, floors, ceilings, and inaccessible enclosures.
  - 4. At access doors and similar access points that permit view of concealed piping.
  - 5. Near major equipment items and other points of origination and termination.
  - 6. Spaced at maximum intervals of 20 feet along each run.
- C. Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.

### 3.5 DUCT LABEL INSTALLATION

- A. Stenciled Duct Label Option: Stenciled labels showing service and flow direction may be provided instead of plastic-laminated duct labels, at Installer's option.
- B. Locate labels near points where ducts enter into and exit from concealed spaces and at maximum intervals of 20 feet in each space where ducts are exposed or concealed by removable ceiling system.

END OF SECTION 230553

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 230553 – IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the identification for HVAC piping and equipment is installed and is in general conformance with the Contract Documents, applicable Codes, and shop drawings. The identification for HVAC piping and equipment has been provided in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_

## SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section Includes:
  - 1. Balancing Air Systems:
    - a. Constant-volume air systems.
  - 2. Control system verification.

## 1.2 DEFINITIONS

- A. AABC: Associated Air Balance Council.
- B. BAS: Building automation systems.
- C. NEBB: National Environmental Balancing Bureau.
- D. TAB: Testing, adjusting, and balancing.
- E. TABB: Testing, Adjusting, and Balancing Bureau.
- F. TAB Specialist: An independent entity meeting qualifications to perform TAB work.
- G. TDH: Total dynamic head.

## 1.3 QUALITY ASSURANCE

- A. All tests shall be made by the contractor in the presence of the owner or his representative.

## PART 2 - PRODUCTS

## PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Examine installed systems for balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are applicable for intended purpose and are accessible.
- B. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
- C. Examine operating safety interlocks and controls on HVAC equipment.

- D. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

### 3.2 PREPARATION

- A. Confirm the following:
  - 1. Duct systems are complete.
  - 2. Volume, smoke, and fire dampers are open and functional.
  - 3. Clean filters are installed.
  - 4. Fans are operating, free of vibration, and rotating in correct direction.
  - 5. Automatic temperature-control systems are operational.
  - 6. Ceilings are installed.
  - 7. Windows and doors are installed.
  - 8. Suitable access to balancing devices and equipment is provided.

### 3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.
  - 1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
- B. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- C. Take and report testing and balancing measurements in inch-pound (IP) units.

### 3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.
- B. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge.
- C. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- D. Verify that motor starters are equipped with properly sized thermal protection.
- E. Check dampers for proper position to achieve desired airflow path.
- F. Check for airflow blockages.
- G. Check condensate drains for proper connections and functioning.
- H. Check for proper sealing of air-handling-unit components.



### 3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

- A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
  - 1. Measure total airflow.
    - a. Set outside-air, return-air, and relief-air dampers for proper position that simulates minimum outdoor-air conditions.
    - b. Where duct conditions allow, measure airflow by Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses to obtain total airflow.
    - c. Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.
    - d. If a reliable Pitot-tube traverse or coil traverse is not possible, measure airflow at terminals and calculate the total airflow.
  - 2. Measure fan static pressures as follows:
    - a. Measure static pressure directly at the fan outlet or through the flexible connection.
    - b. Measure static pressure directly at the fan inlet or through the flexible connection.
    - c. Measure static pressure across each component that makes up the air-handling system.
    - d. Report artificial loading of filters at the time static pressures are measured.
  - 3. Obtain approval from Owner for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
  - 4. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload occurs. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.
- B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows.
  - 1. Measure airflow of submain and branch ducts.
  - 2. Adjust submain and branch duct volume dampers for specified airflow.
  - 3. Re-measure each submain and branch duct after all have been adjusted.
- C. Adjust air inlets and outlets for each space to indicated airflows.
  - 1. Set airflow patterns of adjustable outlets for proper distribution without drafts.
  - 2. Measure inlets and outlets airflow.
  - 3. Adjust each inlet and outlet for specified airflow.
  - 4. Re-measure each inlet and outlet after they have been adjusted.
- D. Verify final system conditions.
  - 1. Re-measure and confirm that minimum outdoor, return, and relief airflows are within design. Readjust to design if necessary.
  - 2. Re-measure and confirm that total airflow is within design.
  - 3. Re-measure all final fan operating data, rpms, volts, amps, and static profile.
  - 4. Mark all final settings.
  - 5. Test system in economizer mode. Verify proper operation and adjust if necessary.
  - 6. Measure and record all operating data.
  - 7. Record final fan-performance data.

### 3.6 TOLERANCES

- A. Set HVAC system's airflow rates and water flow rates within the following tolerances:
  - 1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.
  - 2. Air Outlets and Inlets: Plus or minus 10 percent.

END OF SECTION 230593

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 230593 – TESTING, ADJUSTING, AND BALANCING FOR HVAC

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the testing, adjusting, and balancing for HVAC has been performed and is in general conformance with the Contract Documents, applicable Codes, and shop drawings. The testing, adjusting, and balancing for HVAC has been performed in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

TESTING, ADJUSTING, AND BALANCING FOR HVAC INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_



## SECTION 230713 - DUCT 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 insulating the following duct services:
  - 1. Indoor, concealed supply and outdoor air.
  - 2. Indoor, exposed supply and outdoor air.
  - 3. Indoor, concealed exhaust between isolation damper and penetration of building exterior.
- B. Related Sections:
  - 1. Section 233113 "Metal Ducts" for duct liners.

## PART 2 - PRODUCTS

## 2.1 INSULATION MATERIALS

- A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," and "Aboveground, Outdoor Duct and Plenum Insulation Schedule" articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Owens Corning.
- D. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Owens Corning.
    - b. Or equal.

## 2.2 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
  - 1. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

## 2.3 TAPES

- A. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Avery Dennison Corporation, Specialty Tapes Division.
    - b. Compac Corporation.
    - c. Ideal Tape Co., Inc., an American Biltrite Company.
    - d. Venture Tape.
    - e. Or equal.
  - 2. Width: 3 inches.
  - 3. Thickness: 6.5 mils.
  - 4. Adhesion: 90 ounces force/inch in width.
  - 5. Elongation: 2 percent.
  - 6. Tensile Strength: 40 lbf/inch in width.
  - 7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
  - 1. Verify that systems to be insulated have been tested and are free of defects.
  - 2. Verify that surfaces to be insulated are clean and dry.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

### 3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.
- B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.

- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Keep insulation materials dry during application and finishing.
- G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- H. Install insulation with least number of joints practical.
- I. Where vapor barrier is required by conditions, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
  - 1. Install insulation continuously through hangers and around anchor attachments.
  - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
  - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
- J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- K. Install insulation with factory-applied jackets as follows:
  - 1. Draw jacket tight and smooth.
  - 2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
  - 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
    - a. For below ambient services, apply vapor-barrier mastic over staples.
  - 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
  - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.
- L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

### 3.4 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
  - 1. Seal penetrations with flashing sealant.
  - 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
  - 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
  - 4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
  - 1. Seal penetrations with flashing sealant.
  - 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
  - 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches (50 mm).
  - 4. Seal jacket to wall flashing with flashing sealant.
- C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches (50 mm).
  - 1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

### 3.5 INSTALLATION OF MINERAL-FIBER INSULATION

- A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
  - 1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 50 percent coverage of duct and plenum surfaces.
  - 2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
  - 3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
    - a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
    - b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    - d. Do not overcompress insulation during installation.
    - e. Impale insulation over pins and attach speed washers.



- f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
  - 4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
    - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
  - 5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
  - 6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
- B. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
  - 1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 50 percent coverage of duct and plenum surfaces.
  - 2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
  - 3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
    - a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
    - b. On duct sides with dimensions larger than 18 inches, space pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    - d. Do not overcompress insulation during installation.
    - e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
  - 4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
    - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
    - b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot (5.5-m) intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.
  - 5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.

6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

### 3.6 DUCT INSULATION SCHEDULE, GENERAL

- A. Plenums and Ducts Requiring Insulation:
  1. Indoor, concealed supply.
  2. Indoor, exposed supply (refer to duct liner section).
  3. Indoor, concealed return.
  4. Indoor, exposed return (refer to duct liner section).
  5. Indoor, concealed exhaust between isolation damper and penetration of building exterior.
  6. Indoor, exposed exhaust between isolation damper and penetration of building exterior.
- B. Items Not Insulated:
  1. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
  2. Factory-insulated flexible ducts.
  3. Factory-insulated plenums and casings.
  4. Flexible connectors.
  5. Vibration-control devices.

### 3.7 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

- A. Supply, return, outside air, plenum, exhaust-air duct insulation shall be one of the following:
  1. Mineral-Fiber Blanket: 1-1/2 inches thick and 1.5-lb/cu. ft. nominal density.
  2. Mineral-Fiber Board: 1-1/2 inches thick and 2-lb/cu. ft. nominal density.

END OF SECTION 230713

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 230713 – DUCT INSULATION

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the duct insulation is installed and is in general conformance with the Contract Documents, applicable Codes, and shop drawings. The duct insulation has been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

DUCT INSULATION INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_



## SECTION 231123 - FACILITY NATURAL-GAS PIPING

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section Includes:
  - 1. Pipes, tubes, and fittings.
  - 2. Piping specialties.
  - 3. Piping and tubing joining materials.
  - 4. Valves.
  - 5. Pressure regulators.

## 1.2 PERFORMANCE REQUIREMENTS

- A. Minimum Operating-Pressure Ratings:
  - 1. Piping and Valves: 100 psig minimum unless otherwise indicated.
  - 2. Service Regulators: 100 psig minimum unless otherwise indicated.
- B. Natural-Gas System Pressures within Buildings: Two pressure ranges. Primary pressure is more than 0.5 psig but not more than 2 psig, and is reduced to secondary pressure of 0.5 psig or less.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of the following:
  - 1. Piping specialties.
  - 2. Corrugated, stainless-steel tubing with associated components.
  - 3. Valves. Include pressure rating, capacity, settings, and electrical connection data of selected models.
  - 4. Pressure regulators. Indicate pressure ratings and capacities.

## 1.4 QUALITY ASSURANCE

- A. Steel Support Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.
- 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.

## 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Handling Flammable Liquids: Remove and dispose of liquids from existing natural-gas piping according to requirements of authorities having jurisdiction.

- B. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.
- C. Store and handle pipes and tubes having factory-applied protective coatings to avoid damaging coating and protect from direct sunlight.
- D. Protect stored PE pipes and valves from direct sunlight.

## 1.6 PROJECT CONDITIONS

- A. Perform site survey, research public utility records, and verify existing utility locations. Contact utility-locating service for area where Project is located.
- B. Interruption of Existing Natural-Gas Service: Do not interrupt natural-gas service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide purging and startup of natural-gas supply according to requirements indicated:
  - 1. Notify Construction Manager no fewer than two days in advance of proposed interruption of natural-gas service.
  - 2. Do not proceed with interruption of natural-gas service without Construction Manager's written permission.

## 1.7 COORDINATION

- A. Coordinate sizes and locations of concrete bases with actual equipment provided.
- B. Coordinate requirements for access panels and doors for valves installed concealed behind finished surfaces.

## PART 2 - PRODUCTS

### 2.1 PIPES, TUBES, AND FITTINGS

- A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.
  - 1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
  - 2. Wrought-Steel Welding Fittings: ASTM A 234/A 234M for butt welding and socket welding.
  - 3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
  - 4. Protective Coating for Underground Piping: Factory-applied, three-layer coating of epoxy, adhesive, and PE.
    - a. Joint Cover Kits: Epoxy paint, adhesive, and heat-shrink PE sleeves.

### 2.2 PIPING SPECIALTIES

- A. Appliance Flexible Connectors:
  - 1. Indoor, Fixed-Appliance Flexible Connectors: Comply with ANSI Z21.24.
  - 2. Indoor, Movable-Appliance Flexible Connectors: Comply with ANSI Z21.69.
  - 3. Outdoor, Appliance Flexible Connectors: Comply with ANSI Z21.75.

4. Corrugated stainless-steel tubing with polymer coating.
  5. Operating-Pressure Rating: 0.5 psig.
  6. End Fittings: Zinc-coated steel.
  7. Threaded Ends: Comply with ASME B1.20.1.
  8. Maximum Length: 72 inches
- B. Weatherproof Vent Cap: Cast- or malleable-iron increaser fitting with corrosion-resistant wire screen, with free area at least equal to cross-sectional area of connecting pipe and threaded-end connection.

## 2.3 JOINING MATERIALS

- A. Joint Compound and Tape: Suitable for natural gas.
- B. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- C. Brazing Filler Metals: Alloy with melting point greater than 1000 deg F (540 deg C) complying with AWS A5.8/A5.8M. Brazing alloys containing more than 0.05 percent phosphorus are prohibited.

## 2.4 MANUAL GAS SHUTOFF VALVES

- A. General Requirements for Metallic Valves, NPS 2 and Smaller: Comply with ASME B16.33.
1. CWP Rating: 125 psig.
  2. Threaded Ends: Comply with ASME B1.20.1.
  3. Dryseal Threads on Flare Ends: Comply with ASME B1.20.3.
  4. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
  5. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves 1 inch and smaller.
  6. Service Mark: Valves 1-1/4 inches to NPS 2 shall have initials "WOG" permanently marked on valve body.
- B. General Requirements for Metallic Valves, NPS 2-1/2 and Larger: Comply with ASME B16.38.
1. CWP Rating: 125 psig.
  2. Flanged Ends: Comply with ASME B16.5 for steel flanges.
  3. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
  4. Service Mark: Initials "WOG" shall be permanently marked on valve body.

## 2.5 PRESSURE REGULATORS

- A. General Requirements:
1. Single stage and suitable for natural gas.
  2. Steel jacket and corrosion-resistant components.
  3. Elevation compensator.
  4. End Connections: Threaded for regulators NPS 2 and smaller; flanged for regulators NPS 2-1/2 and larger.

- B. Line Pressure Regulators: Comply with ANSI Z21.80.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Actaris.
    - b. Eclipse Innovative Thermal Technologies.
    - c. Fisher Control Valves & Instruments; a brand of Emerson Process Management.
    - d. Maxitrol Company.
  - 2. Body and Diaphragm Case: Cast iron or die-cast aluminum.
  - 3. Springs: Zinc-plated steel; interchangeable.
  - 4. Diaphragm Plate: Zinc-plated steel.
  - 5. Seat Disc: Nitrile rubber resistant to gas impurities, abrasion, and deformation at the valve port.
  - 6. Orifice: Aluminum; interchangeable.
  - 7. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
  - 8. Single-port, self-contained regulator with orifice no larger than required at maximum pressure inlet, and no pressure sensing piping external to the regulator.
  - 9. Pressure regulator shall maintain discharge pressure setting downstream, and not exceed 150 percent of design discharge pressure at shutoff.
  - 10. Overpressure Protection Device: Factory mounted on pressure regulator.
  - 11. Atmospheric Vent: Factory- or field-installed, stainless-steel screen in opening if not connected to vent piping.
  - 12. Maximum Inlet Pressure: 2 psig.

## 2.6 LABELING AND IDENTIFYING

- A. Detectable Warning Tape: Acid- and alkali-resistant, PE film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored yellow.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine roughing-in for natural-gas piping system to verify actual locations of piping connections before equipment installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Close equipment shutoff valves before turning off natural gas to premises or piping section.
- B. Inspect natural-gas piping according to NFPA 54 local authority having jurisdiction to determine that natural-gas utilization devices are turned off in piping section affected.
- C. Comply with NFPA 54 requirements for prevention of accidental ignition.



### 3.3 OUTDOOR PIPING INSTALLATION

- A. Comply with NFPA 54 local authority having jurisdiction for installation and purging of natural-gas piping.
- B. Steel Piping with Protective Coating:
  - 1. Apply joint cover kits to pipe after joining to cover, seal, and protect joints.
  - 2. Replace pipe having damaged PE coating with new pipe.
- C. Install fittings for changes in direction and branch connections.

### 3.4 INDOOR PIPING INSTALLATION

- A. Comply with NFPA 54 for installation and purging of natural-gas piping.
- B. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Locate valves for easy access.
- F. Install natural-gas piping at uniform grade of 2 percent down toward drip and sediment traps.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Verify final equipment locations for roughing-in.
- J. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.
- K. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets. Locate where accessible to permit cleaning and emptying. Do not install where condensate is subject to freezing.
  - 1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 3 inches (75 mm) long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.
- L. Extend relief vent connections for service regulators, line regulators, and overpressure protection devices to outdoors and terminate with weatherproof vent cap.
- M. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels unless indicated to be exposed to view.

- N. Concealed Location Installations: Except as specified below, install concealed natural-gas piping and piping installed under the building in containment conduit constructed of steel pipe with welded joints as described in Part 2. Install a vent pipe from containment conduit to outdoors and terminate with weatherproof vent cap.
1. Above Accessible Ceilings: Natural-gas piping, fittings, valves, and regulators may be installed in accessible spaces without containment conduit.
  2. In Floors: Install natural-gas piping with welded or brazed joints and protective coating in cast-in-place concrete floors. Cover piping to be cast in concrete slabs with minimum of 1-1/2 inches (38 mm) of concrete. Piping may not be in physical contact with other metallic structures such as reinforcing rods or electrically neutral conductors. Do not embed piping in concrete slabs containing quick-set additives or cinder aggregate.
  3. In Floor Channels: Install natural-gas piping in floor channels. Channels must have cover and be open to space above cover for ventilation.
  4. In Walls or Partitions: Protect tubing installed inside partitions or hollow walls from physical damage using steel striker barriers at rigid supports.
    - a. Exception: Tubing passing through partitions or walls does not require striker barriers.
  5. Prohibited Locations:
    - a. Do not install natural-gas piping in or through circulating air ducts, clothes or trash chutes, chimneys or gas vents (flues), ventilating ducts, or dumbwaiter or elevator shafts.
    - b. Do not install natural-gas piping in solid walls or partitions.
- O. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.
- P. Connect branch piping from top or side of horizontal piping.
- Q. Install unions in pipes NPS 2 and smaller, adjacent to each valve, at final connection to each piece of equipment. Unions are not required at flanged connections.
- R. Do not use natural-gas piping as grounding electrode.
- S. Install strainer on inlet of each line-pressure regulator and automatic or electrically operated valve.

### 3.5 VALVE INSTALLATION

- A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing, aluminum, or copper connector.
- B. Install underground valves with valve boxes.
- C. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.
- D. Install earthquake valves aboveground outside buildings according to listing.
- E. Install anode for metallic valves in underground PE piping.

### 3.6 PIPING JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Threaded Joints:
  - 1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
  - 2. Cut threads full and clean using sharp dies.
  - 3. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.
  - 4. Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.
  - 5. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- D. Welded Joints:
  - 1. Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators.
  - 2. Bevel plain ends of steel pipe.
  - 3. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter.
- F. Flanged Joints: Install gasket material, size, type, and thickness appropriate for natural-gas service. Install gasket concentrically positioned.
- G. Flared Joints: Cut tubing with roll cutting tool. Flare tube end with tool to result in flare dimensions complying with SAE J513. Tighten finger tight, then use wrench. Do not overtighten.
- H. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.
  - 1. Plain-End Pipe and Fittings: Use butt fusion.
  - 2. Plain-End Pipe and Socket Fittings: Use socket fusion.

### 3.7 HANGER AND SUPPORT INSTALLATION

- A. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:
  - 1. NPS 1 and Smaller: Maximum span, 96 inches; minimum rod size, 3/8 inch.
  - 2. NPS 1-1/4: Maximum span, 108 inches; minimum rod size, 3/8 inch.
  - 3. NPS 1-1/2 and NPS 2: Maximum span, 108 inches; minimum rod size, 3/8 inch.
  - 4. NPS 2-1/2 to NPS 3-1/2: Maximum span, 10 feet; minimum rod size, 1/2 inch.
  - 5. NPS 4 and Larger: Maximum span, 10 feet; minimum rod size, 5/8 inch.
- B. Install hangers for horizontal drawn-temper copper tubing with the following maximum spacing and minimum rod sizes:
  - 1. NPS 3/8: Maximum span, 48 inches; minimum rod size, 3/8 inch.
  - 2. NPS 1/2 and NPS 5/8: Maximum span, 72 inches; minimum rod size, 3/8 inch.
  - 3. NPS 3/4 and NPS 7/8: Maximum span, 84 inches; minimum rod size, 3/8 inch.
  - 4. NPS 1: Maximum span, 96 inches; minimum rod size, 3/8 inch.

### 3.8 CONNECTIONS

- A. Connect to utility's gas main according to utility's procedures and requirements.
- B. Install natural-gas piping electrically continuous and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.
- C. Install piping adjacent to appliances to allow service and maintenance of appliances.
- D. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.
- E. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

### 3.9 LABELING AND IDENTIFYING

- A. Install detectable warning tape directly above gas piping, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

### 3.10 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
  - 1. Test, inspect, and purge natural gas according to NFPA 54 and authorities having jurisdiction.
- C. Natural-gas piping will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

### 3.11 OUTDOOR PIPING SCHEDULE

- A. Aboveground natural-gas piping shall be the following:
  - 1. Steel pipe with malleable-iron fittings and threaded joints.
  - 2. Steel pipe with wrought-steel fittings and welded joints.

### 3.12 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES LESS THAN 0.5 PSIG

- A. Aboveground, branch piping NPS 1 and smaller shall be the following:
  - 1. Steel pipe with malleable-iron fittings and threaded joints.
- B. Aboveground, distribution piping shall be the following:
  - 1. Steel pipe with malleable-iron fittings and threaded joints.
  - 2. Steel pipe with wrought-steel fittings and welded joints.

3.13 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES MORE THAN 0.5 PSIG AND LESS THAN 5 PSIG

Aboveground, branch piping NPS 1 and smaller shall be the following:

1. Steel pipe with malleable-iron fittings and threaded joints.

B. Aboveground, distribution piping shall be the following:

1. Steel pipe with malleable-iron fittings and threaded joints.
2. Steel pipe with steel welding fittings and welded joints.

C. Underground, below building, piping shall be the following:

1. Steel pipe with malleable-iron fittings and threaded joints.
2. Steel pipe with wrought-steel fittings and welded joints.

END OF SECTION 231123

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 231123 – FACILITY NATURAL-GAS PIPING

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the facility natural-gas piping is installed and is in general conformance with the Contract Documents, applicable Codes, and shop drawings. The facility natural-gas piping has been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

FACILITY NATURAL-GAS PIPING INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_

## SECTION 233113 - METAL DUCTS

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section Includes:
  - 1. Single-wall rectangular ducts and fittings.
  - 2. Single-wall round ducts and fittings.
  - 3. Sheet metal materials.
  - 4. Duct liner.
  - 5. Sealants and gaskets.
  - 6. Hangers and supports.

## PART 2 - PRODUCTS

## 2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

## 2.2 SINGLE-WALL ROUND DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support

intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

## 2.3 SHEET METAL MATERIALS

- A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
  - 1. Galvanized Coating Designation: G60.
  - 2. Finishes for Surfaces Exposed to View: Mill phosphatized.
- C. Aluminum Sheets: Comply with ASTM B 209 Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.
- D. Factory- or Shop-Applied Antimicrobial Coating:
  - 1. Apply to the surface of sheet metal that will form the interior surface of the duct. An untreated clear coating shall be applied to the exterior surface.
  - 2. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
  - 3. Coating containing the antimicrobial compound shall have a hardness of 2H, minimum, when tested according to ASTM D 3363.
  - 4. Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
  - 5. Shop-Applied Coating Color: Black.
  - 6. Antimicrobial coating on sheet metal is not required for duct containing liner treated with antimicrobial coating.

## 2.4 DUCT LINER

- A. Fibrous-Glass Duct Liner: Comply with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Owens Corning.
    - b. Or equal.
    - c. Maximum Thermal Conductivity:
      - 1) Type I, Flexible: 0.24 at 75 deg F mean temperature.
      - 2) Type II, Rigid: 0.24 at 75 deg F mean temperature.



## 2.5 HANGERS AND SUPPORTS

- A. Cadmium-plated steel rods and nuts.
- B. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1 (Table 5-1M), "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."
- C. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.
- D. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- E. Trapeze and Riser Supports:
  - 1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.

## PART 3 - EXECUTION

### 3.1 DUCT INSTALLATION

- A. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- B. Install round ducts in maximum practical lengths.
- C. Install ducts with fewest possible joints.
- D. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- E. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- F. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- G. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
- H. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.
- I. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.
- J. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Section 233300 "Air Duct Accessories" for fire and smoke dampers.

### 3.2 INSTALLATION OF EXPOSED DUCTWORK

- A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.
- B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.
- C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.
- D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.
- E. Repair or replace damaged sections and finished work that does not comply with these requirements.

### 3.3 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."
- B. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.
- C. Hangers Exposed to View: Threaded rod and angle or channel supports.
- D. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.
- E. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

### 3.4 CONNECTIONS

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

END OF SECTION 233113

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 233113 – METAL DUCTS

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the metal ducts are installed and are in general conformance with the Contract Documents, applicable Codes, and shop drawings. The metal ducts have been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

METAL DUCT INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_



## SECTION 233300 - AIR DUCT ACCESSORIES

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section Includes:
  - 1. Backdraft and pressure relief dampers.
  - 2. Manual volume dampers.
  - 3. Control dampers.
  - 4. Fire dampers.
  - 5. Combination fire and smoke dampers.
  - 6. Turning vanes.
  - 7. Duct-mounted access doors.
  - 8. Flexible connectors.
  - 9. Flexible ducts.

## PART 2 - PRODUCTS

## 2.1 ASSEMBLY DESCRIPTION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

## 2.2 MATERIALS

- A. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
  - 1. Galvanized Coating Designation: G60.
  - 2. Exposed-Surface Finish: Mill phosphatized.
- B. Aluminum Sheets: Comply with ASTM B 209 Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.
- C. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

## 2.3 BACKDRAFT DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Price or equal.
- B. Description: Gravity balanced.
- C. Maximum Air Velocity: 1000 fpm.

- D. Maximum System Pressure: 1-inch wg.
- E. Frame: Hat-shaped, 0.05-inch- with welded corners or mechanically attached and mounting flange.
- F. Blades: Multiple single-piece blades, center pivoted, off-center pivoted, end pivoted, maximum 6-inch width, with sealed edges.
- G. Blade Action: Parallel.
- H. Blade Seals: Felt.
- I. Blade Axles:
  - 1. Material: Nonferrous metal.
  - 2. Diameter: 0.20 inch.
- J. Tie Bars and Brackets: Galvanized steel.
- K. Return Spring: Adjustable tension.
- L. Bearings: Steel ball.
- M. Accessories:
  - 1. 90-degree stops.

## 2.4 MANUAL VOLUME DAMPERS

- A. Standard, Steel, Manual Volume Dampers:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Price or equal.
  - 2. Standard leakage rating.
  - 3. Suitable for horizontal or vertical applications.
  - 4. Frames:
    - a. Frame: Hat-shaped, 0.094-inch- thick, galvanized sheet steel.
    - b. Mitered and welded corners.
    - c. Flanges for attaching to walls and flangeless frames for installing in ducts.
  - 5. Blades:
    - a. Multiple or single blade.
    - b. Parallel- or opposed-blade design.
    - c. Stiffen damper blades for stability.
    - d. Galvanized-steel, 0.064 inch thick.
  - 6. Blade Axles: Galvanized steel.
  - 7. Bearings:
    - a. Oil-impregnated bronze.
    - b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
  - 8. Tie Bars and Brackets: Galvanized steel.

## 2.5 FIRE DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Price or equal.
- B. Type: Static; rated and labeled according to UL 555 by an NRTL.
- C. Fire Rating: 1-1/2 and 3 hours.
- D. Frame: Curtain type with blades outside airstream; fabricated with roll-formed, 0.034-inch- thick galvanized steel; with mitered and interlocking corners.
- E. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel.
  1. Minimum Thickness: 0.138 inch thick, as indicated, and of length to suit application.
  2. Exception: Omit sleeve where damper-frame width permits direct attachment of perimeter mounting angles on each side of wall or floor; thickness of damper frame must comply with sleeve requirements.
- F. Mounting Orientation: Vertical or horizontal as indicated.
- G. Blades: Roll-formed, interlocking, 0.024-inch- thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch- thick, galvanized-steel blade connectors.
- H. Horizontal Dampers: Include blade lock and stainless-steel closure spring.
- I. Heat-Responsive Device: Replaceable, 165 deg F rated, fusible links.

## 2.6 COMBINATION FIRE AND SMOKE DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Price or equal.
- B. Type: Dynamic; rated and labeled according to UL 555 and UL 555S by an NRTL.
- C. Closing rating in ducts up to 4-inch wg static pressure class and minimum 2000-fpm velocity.
- D. Fire Rating: 1-1/2 and 3 hours.
- E. Frame: Hat-shaped, 0.094-inch- thick, galvanized sheet steel, with welded corners and mounting flange.
- F. Heat-Responsive Device: Electric resettable device and switch package, factory installed, rated.
- G. Smoke Detector: Integral, factory wired for single-point connection.
- H. Blades: Roll-formed, horizontal, interlocking, 0.063-inch- thick, galvanized sheet steel.
- I. Rated pressure and velocity to exceed design airflow conditions.
- J. Mounting Sleeve: Factory-installed, 0.039-inch- thick, galvanized sheet steel; length to suit wall or floor application.
- K. Master control panel for use in dynamic smoke-management systems.
- L. Damper Motors: Modulating or two-position action.

## 2.7 TURNING VANES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Titus or equal.
- B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
  - 1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.
- C. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 4-3, "Vanes and Vane Runners," and 4-4, "Vane Support in Elbows."
- D. Vane Construction: Double wall.

## 2.8 DUCT-MOUNTED ACCESS DOORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Price or equal.
- B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 7-2 (7-2M), "Duct Access Doors and Panels," and 7-3, "Access Doors - Round Duct."

## 2.9 FLEXIBLE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Price or equal.
- B. Materials: Flame-retardant or noncombustible fabrics.
- C. Coatings and Adhesives: Comply with UL 181, Class 1.
- D. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
  - 1. Minimum Weight: 26 oz./sq. yd.
  - 2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
  - 3. Service Temperature: Minus 40 to plus 200 deg F.

## 2.10 FLEXIBLE DUCTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Thermaflex
  - 2. ATCO
- B. Insulated, Flexible Duct: UL 181, Class 1, black polymer film supported by helically wound, spring-steel wire; fibrous-glass insulation; aluminized vapor-barrier film.
  - 1. Pressure Rating: 4-inch wg positive and 0.5-inch wg negative.
  - 2. Maximum Air Velocity: 4000 fpm.



3. Temperature Range: Minus 20 to plus 175 deg F.
4. Insulation R-Value: Comply with ASHRAE/IESNA 90.1.

## 2.11 DUCT ACCESSORY HARDWARE

- A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.
- B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts.
- B. Install backdraft dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.
- C. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
  1. Install steel volume dampers in steel ducts.
- D. Set dampers to fully open position before testing, adjusting, and balancing.
- E. Install test holes at fan inlets and outlets and elsewhere as indicated.
- F. Install fire and smoke dampers according to UL listing.

END OF SECTION 233300

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 233300 – AIR DUCT ACCESSORIES

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the air duct accessories are installed and are in general conformance with the Contract Documents, applicable Codes, and shop drawings. The air duct accessories have been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

AIR DUCT ACCESSORIES INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_

## SECTION 233423 - HVAC POWER VENTILATORS

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section Includes:
  - 1. In-line centrifugal fans.
  - 2. Propeller fans.

## 1.2 PERFORMANCE REQUIREMENTS

- A. Project Altitude: Base fan-performance ratings on actual Project site elevations.

## 1.3 COORDINATION

- A. Coordinate size and location of structural-steel support members.
- B. Coordinate sizes and locations of concrete bases with actual equipment provided.
- C. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

## PART 2 - PRODUCTS

## 2.1 IN-LINE CENTRIFUGAL FANS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Greenheck Fan Corporation.
  - 2. Loren Cook Company.
  - 3. PennBarry.
- B. Housing: Split, spun aluminum with aluminum straightening vanes, inlet and outlet flanges, and support bracket adaptable to floor, side wall, or ceiling mounting.
- C. Direct-Drive Units: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing.
- D. Belt-Driven Units: Motor mounted on adjustable base, with adjustable sheaves, enclosure around belts within fan housing, and lubricating tubes from fan bearings extended to outside of fan housing.
- E. Fan Wheels: Aluminum, airfoil blades welded to aluminum hub.
- F. Accessories: See Construction Documents

## 2.2 PROPELLER FANS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Loren Cook Company.
  - 2. PennBarry.
  - 3. Greenheck
- B. Housing: Galvanized-steel sheet with flanged edges and integral orifice ring with baked-enamel finish coat applied after assembly.
- C. Fan Wheel: Replaceable, cast-aluminum, airfoil blades fastened to cast-aluminum hub; factory set pitch angle of blades.
- D. Fan Drive: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing.
- E. Fan Drive:
  - 1. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings
- F. Accessories: See Construction Documents.
- G. Capacities and Characteristics: See Construction Documents.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install power ventilators level and plumb.
- B. Support suspended units from structure using threaded steel rods per manufacturer's instructions.
- C. Install units with clearances for service and maintenance.
- D. Label units according to requirements specified in Section 230553 "Identification for HVAC Piping and Equipment."

### 3.2 CONNECTIONS

- A. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors.
- B. Install ducts adjacent to power ventilators to allow service and maintenance.
- C. According to Section 260526 "Grounding and Bonding for Electrical Systems."
- D. According to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

### 3.3 FIELD QUALITY CONTROL

- A. Tests and Inspections:
  - 1. Verify that shipping, blocking, and bracing are removed.
  - 2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
  - 3. Verify that cleaning and adjusting are complete.
  - 4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
  - 5. Adjust belt tension.
  - 6. Adjust damper linkages for proper damper operation.
  - 7. Verify lubrication for bearings and other moving parts.
  - 8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
  - 9. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
  - 10. Shut unit down and reconnect automatic temperature-control operators.
  - 11. Remove and replace malfunctioning units and retest as specified above.
- B. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

### 3.4 ADJUSTING

- A. Adjust damper linkages for proper damper operation.
- B. Adjust belt tension.
- C. Lubricate bearings.

END OF SECTION 233423

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 233423 – HVAC POWER VENTILATORS

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the HVAC power ventilators are installed and are in general conformance with the Contract Documents, applicable Codes, and shop drawings. The HVAC power ventilators have been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

HVAC POWER VENTILATOR INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_

## SECTION 233713.13 - AIR DIFFUSERS

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section Includes:
  - 1. Rectangular and square ceiling diffusers.
  - 2. Perforated diffusers.
  - 3. Louver face diffusers.

## 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
  - 2. Diffuser Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

## PART 2 - PRODUCTS

## 2.1 RECTANGULAR AND SQUARE CEILING DIFFUSERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Anemostat Products; a Mestek company.
  - 2. Carnes Company.
  - 3. Krueger.
  - 4. Titus.
  - 5. Tuttle & Bailey.
- B. Material: Steel.
- C. Finish: Baked enamel, white.

## 2.2 PERFORATED DIFFUSERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Anemostat Products; a Mestek company.
  - 2. Carnes Company.
  - 3. Krueger.
  - 4. Titus.
  - 5. Tuttle & Bailey.
- B. Material: Steel backpan and pattern controllers, with steel face.
- C. Finish: Baked enamel, white.

## 2.3 LOUVER FACE DIFFUSERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Anemostat Products; a Mestek company.
  - 2. Carnes Company.
  - 3. Titus.
  - 4. Tuttle & Bailey.
- B. Material: Steel.
- C. Finish: Baked enamel, white.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas where registers and grilles are installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Install registers and grilles level and plumb.
- B. Outlets and Inlets Locations: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- C. Install registers and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

### 3.3 ADJUSTING

- A. After installation, adjust registers and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 233713.13



CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 233713.13 – AIR DIFFUSERS

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the air diffusers are installed and are in general conformance with the Contract Documents, applicable Codes, and shop drawings. The air diffusers have been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

AIR DIFFUSER INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_



## SECTION 233713.23 - AIR REGISTERS AND GRILLES

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section Includes:
  - 1. Registers and grilles.

## 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
  - 2. Register and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

## PART 2 - PRODUCTS

## 2.1 REGISTERS &amp; GRILLES

- A. Fixed Face Register & Grille:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Anemostat Products; a Mestek company.
    - b. Carnes Company.
    - c. Krueger.
    - d. Titus.
    - e. Tuttle & Bailey.
  - 2. Material: Steel.
  - 3. Finish: Baked enamel, white.

## PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Examine areas where registers and grilles are installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 INSTALLATION

- A. Install registers and grilles level and plumb.

- B. Outlets and Inlets Locations: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- C. Install registers and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

### 3.3 ADJUSTING

- A. After installation, adjust registers and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 233713.23

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 233713.23 – REGISTERS AND GRILLES

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the registers and grilles are installed and are in general conformance with the Contract Documents, applicable Codes, and shop drawings. The registers and grilles have been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

REGISTER AND GRILLE INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_



## SECTION 235523.16 - HIGH-INTENSITY, GAS-FIRED, RADIANT HEATERS

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section Includes:
  - 1. High-intensity, infrared, gas-fired, radiant heaters.

## 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Shop Drawings:
  - 1. Detail fabrication and assembly of high-intensity, gas-fired, radiant heaters, as well as procedures and diagrams.
  - 2. Include diagrams for power, signal, and control wiring.

## 1.3 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For gas-fired, radiant heaters to include in emergency, operation, and maintenance manuals.

## 1.4 WARRANTY

- A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace components of radiant heaters that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: All warranty periods listed below are from date of Substantial Completion.
    - a. Heater Components: 10 year(s).

## PART 2 - PRODUCTS

## 2.1 PERFORMANCE REQUIREMENTS

- A. Comply with ANSI Z83.19A.
  - 1. UL listed and labeled, with UL label clearly visible on units.

## 2.2 HIGH-INTENSITY, INFRARED, GAS-FIRED, RADIANT HEATERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Detroit Radiant Products Company.
2. Roberts-Gordon, Inc.
3. Solaronics, Inc.
4. Space-Ray; a division of Gas-Fired Products Inc. Contact: Evelyn Kelch, National Accounts Manager, (888) 383-5965; FAX: (800) 869-7485.

## 2.3 U-TUBE HEATERS

- A. The heaters shall utilize factory assembled, highly-efficient aluminum reflectors with a reflectivity of 97.5% and designed for U-tube heaters. The tube body and u-bend shall be totally enclosed with a single reflector to maximize emitter temperature and radiant heat exchange between the firing and exhaust legs. In addition, the reflector ends shall be enclosed for maximum radiant heat output and minimum convection losses. The single reflector design shall cover the firing and exhaust legs as well as the entire u-bend. U-tube configuration made of straight tubes with individual reflectors covering the firing and exhaust legs shall not be accepted.
- B. The heater's emitter tube shall operate at an average surface temperature of 750°F-900°F and shall be made of 16-gauge calorized aluminized steel or calorized titanium alloy Alumi-Therm steel for long life (3" O.D. for LTU40-75 and 4" O.D. for LTU80-250). The emitter tube shall be calorized for longevity, corrosion resistance, and high radiant efficiency. The measured surface emissivity shall be 0.83-0.86 at operating temperature. The calorization process shall produce an emitter tube that is highly radiant absorptive on the interior (0.95) and highly radiant emissive (0.83-0.86) on the exterior. The system shall have a radiant efficiency (or radiant coefficient) of 65%.
- C. To assure a high degree of safety and increased radiant efficiency, the heaters shall operate under negative pressure at all times during operation to preclude the escape of combustion gases inside the building. The heater exhaust assembly shall include a 120-volt draft inducer. The draft inducer shall be equipped with a permanently lubricated, totally enclosed and shielded, fan cooled, and heavy-duty ball bearing motor. The motor shall not require maintenance or lubrication for the life of the unit. The draft inducer assembly shall be capable of rotating 90° for vertical or horizontal venting.
- D. Heaters shall be equipped with a 24-volt direct spark ignition with automatic 100% shutoff system. Power supplied to each heater shall be 120 VAC, 60 Hz. The heater controls shall include a pressure switch designed to provide complete unit shutoff in the event of combustion air or flue blockage. The heaters shall be equipped with an on-line diagnosis monitoring light system. The three lights shall monitor the power to the heater, insufficient airflow, and the spark ignition and the combination gas valve operation.
- E. The heater's burner shall consist of a heavy-duty cast iron atmospheric burner. The flame characteristics shall be highly luminous for maximum radiant heat transfer through the emitter tube wall.
- F. Heaters shall operate satisfactorily in any position from horizontal to forty-five degrees (45°) from horizontal, and shall be suitable for vented/indirect vented applications. Heaters shall be designed to operate on natural or propane gas.



## 2.4 STRAIGHT TUBE HEATERS

- A. The heaters shall utilize factory assembled, highly efficient aluminum reflectors with a reflectivity of 97.5%. The reflector ends shall be enclosed for maximum radiant heat output and minimum convection losses. Heaters shall be equipped with a 24-volt direct spark ignition with automatic 100% shutoff system. Power supplied to each heater shall be 120 VAC, 60 Hz. The heater controls shall include a pressure switch designed to provide complete unit shutoff in the event of combustion air or flue blockage. The heaters shall be equipped with an on-line diagnosis monitoring light system. The three lights shall monitor the power to the heater, insufficient airflow and the spark ignition and combination gas valve operation.
- B. The heater's burner shall consist of a heavy-duty cast iron atmospheric burner. The flame characteristics shall be highly luminous for maximum radiant heat transfer through the emitter tube wall.
- C. The heater's emitter tube shall operate at an average surface temperature of 700°F - 800°F and shall be made of 16-gauge calorized aluminized steel or calorized titanium alloy Alumi-Therm steel for long life (4" O.D.). The emitter tube shall be calorized for longevity, corrosion resistance, and high radiant efficiency. The measured surface emissivity shall be 0.83 - 0.86 at operating temperature. The calorization process shall produce an emitter tube that is highly radiant absorptive (0.95) on the interior and highly radiant emissive (0.83-0.86) on the exterior. The system shall have a radiant efficiency (or radiant coefficient) of 58%.
- D. To assure a high degree of safety and increased radiant efficiency, the heaters shall operate under negative pressure at all times during operation to preclude the escape of combustion gases inside the building. The heater exhaust assembly shall include a 120-volt draft inducer. The draft inducer shall be equipped with a permanently lubricated, totally enclosed and shielded, fan cooled, and heavy-duty ball bearing motor. The motor shall not require maintenance or lubrication for the life of the unit. The draft inducer assembly shall be capable of rotating 90° for vertical or horizontal venting.
- E. The heaters will be CSA design certified for vertical or horizontal venting, maximum 75 feet horizontal sidewall venting, and for 50 feet outside combustion air inlet duct. There shall be no draft hoods. The combustion chamber shall be totally enclosed.
- F. The heaters shall be factory assembled and tested. The heaters shall not require any field adjustments to assure maximum performance and safety. Heaters shall operate satisfactorily in any position from horizontal to forty-five degrees (45°) from horizontal, and incline mounted up to 2/12 pitch, and shall be suitable for vented/indirect vented applications. Heaters shall be designed to operate on natural or propane gas.

## 2.5 CONTROLS AND SAFETIES

- A. Failure Safeguards: 100 percent main gas shutoff on pilot or power failure.

## PART 3 - EXECUTION

## 3.1 INSTALLATION

- A. Equipment Installation: Install gas-fired, radiant heaters and associated gas features and systems according to NFPA 54.
- B. Suspended Units: Mount to substrate using rigid mounting kits or brackets, supplied by manufacturer or manufactured.
- C. Maintain manufacturers' recommended clearances for combustibles.

## 3.2 CONNECTIONS

- A. Gas Piping: Connect gas piping to gas train inlet; provide union with enough clearance for burner removal and service.
  - 1. Gas Connections: Connect gas piping to radiant heaters according to NFPA 54.
- B. Where installing piping adjacent to gas-fired, radiant heaters, allow space for service and maintenance.
- C. Electrical Connections: Comply with applicable requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
  - 1. Install electrical devices furnished with heaters but not specified to be factory mounted.

## 3.3 ADJUSTING

- A. Adjust initial-temperature set points.
- B. Adjust burner and other unit components for optimum heating performance and efficiency.

END OF SECTION 235523.16

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 235523.16 – HIGH-INTENSITY, GAS-FIRED, RADIANT HEATERS

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the high-intensity, gas-fired, radiant heaters are installed and are in general conformance with the Contract Documents, applicable Codes, and shop drawings. The high-intensity, gas-fired, radiant heaters have been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

HIGH-INTENSITY, GAS-FIRED, RADIANT HEATER INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_



## SECTION 235533.16 - GAS-FIRED UNIT HEATERS

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section includes gas-fired unit heaters.

## 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of gas-fired unit heater.
  - 1. Include rated capacities, operating characteristics, and accessories.
- B. Shop Drawings: For gas-fired unit heaters.
  - 1. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 2. Include diagrams for power and control wiring.

## 1.3 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For gas-fired unit heaters to include in emergency, operation, and maintenance manuals.

## 1.4 QUALITY ASSURANCE

- A. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

## 1.5 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace heat exchanger of gas-fired unit heater that fails in materials or workmanship within specified warranty period.
  - 1. Warranty Period: Two years from date of Substantial Completion.

## PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Lennox Industries, Inc.; Lennox International. Contact: Katie L. Schmitter, National Accounts Manager; Telephone: (847) 289-1181; FAX: (847) 289-1182; Email: katie.schmitter@lennoxind.com.
  - 2. Modine Manufacturing Company.
  - 3. REZNOR; Thomas & Betts Corporation, a member of ABB Group.

4. Sterling HVAC Products; a Mestek company.

## 2.2 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

## 2.3 MANUFACTURED UNITS

- A. Description: Factory assembled, piped, and wired, and complying with ANSI Z83.8/CSA 2.6.
- B. Gas Type: Design burner for natural gas having characteristics same as those of gas available at Project site.
- C. Type of Venting: Indoor, separated combustion, vented.
- D. Housing: Steel, with integral draft hood and inserts for suspension mounting rods.
- E. Heat Exchanger: Aluminized steel.
- F. Burner Material: Aluminized steel with stainless-steel inserts.
- G. Unit Fan:
- H. Controls: Regulated redundant gas valve containing pilot solenoid valve, electric gas valve, pilot filter, pressure regulator, pilot shutoff, and manual shutoff all in one body.
  1. Gas Control Valve: Single stage.
  2. Ignition: Electronically controlled electric spark with flame sensor.
  3. Fan Thermal Switch: Operates fan on heat-exchanger temperature.
  4. Control transformer.
  5. High Limit: Thermal switch or fuse to stop burner.
  6. Wall-Mounted Thermostat:
    - a. Single stage.
    - b. Fan on-off-automatic switch.
    - c. 50 to 90 deg F operating range.
- I. Electrical Connection: Factory wire motors and controls for a single electrical connection.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install and connect gas-fired unit heaters and associated gas and vent features and systems according to NFPA 54, applicable local codes and regulations, and manufacturer's written instructions.

### 3.2 EQUIPMENT MOUNTING

- A. Suspended Units: Suspend from substrate using threaded rods, spring hangers, and building attachments. Secure rods to unit hanger attachments. Adjust hangers so unit is level and plumb.

### 3.3 CONNECTIONS

- A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Where installing piping adjacent to gas-fired unit heater, allow space for service and maintenance.
- C. Gas Piping: Comply with Section 231123 "Facility Natural-Gas Piping." Connect gas piping to gas train inlet; provide union with enough clearance for burner removal and service.
- D. Vent Connections: Comply with Division 23 Sections.
- E. Ground equipment according to Division 26 Sections Systems.

### 3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
  - 1. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

### 3.5 ADJUSTING

- A. Adjust initial temperature set points.
- B. Adjust burner and other unit components for optimum heating performance and efficiency.

END OF SECTION 235533.16

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 235533.16 – GAS-FIRED UNIT HEATERS

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the gas-fired unit heaters are installed and are in general conformance with the Contract Documents, applicable Codes, and shop drawings. The gas-fired unit heaters have been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

GAS-FIRED UNIT HEATER INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_



## SECTION 237413 - PACKAGED, OUTDOOR, CENTRAL-STATION AIR-HANDLING UNITS

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. This Section includes packaged, outdoor, central-station air-handling units (rooftop units) with the following components and accessories:
  - 1. Direct-expansion cooling.
  - 2. Gas furnace.
  - 3. Economizer outdoor- and return-air damper section.
  - 4. Integral, space temperature controls.
  - 5. Roof curbs.

## 1.2 ACTION SUBMITTALS

- A. Product Data: Include manufacturer's technical data for each RTU, including rated capacities, dimensions, required clearances, characteristics, furnished specialties, and accessories.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 1. Wiring Diagrams: Power, signal, and control wiring.

## 1.3 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For RTUs to include in emergency, operation, and maintenance manuals.

## 1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Fan Belts: One set for each belt-driven fan.
  - 2. Filters: One set of filters for each unit.

## 1.5 QUALITY ASSURANCE

- A. ARI Compliance:
  - 1. Comply with ARI 203/110 and ARI 303/110 for testing and rating energy efficiencies for RTUs.
  - 2. Comply with ARI 270 for testing and rating sound performance for RTUs.
- B. ASHRAE Compliance:
  - 1. Comply with ASHRAE 15 for refrigeration system safety.
  - 2. Comply with ASHRAE 33 for methods of testing cooling and heating coils.

- C. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."
- D. NFPA Compliance: Comply with NFPA 90A and NFPA 90B.
- E. UL Compliance: Comply with UL 1995.
- F. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

## 1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to replace components of RTUs that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period for Compressors: Manufacturer's standard, but not less than five years from date of Substantial Completion.
  - 2. Warranty Period for Gas Furnace Heat Exchangers: Manufacturer's standard, but not less than 20 years from date of Substantial Completion.
  - 3. Warranty Period for Solid-State Ignition Modules: Manufacturer's standard, but not less than three years from date of Substantial Completion.
  - 4. Warranty Period for Control Boards: Manufacturer's standard, but not less than three years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Carrier Corporation; a unit of United Technologies Corp. Contact: Mike Smid, National Accounts Manager; Telephone (708) 418-7830.
  - 2. Lennox Industries, Inc.; Lennox International. Contact: Fred Bryant, National Accounts Manager; Telephone: (513) 570-1513; FAX: (847) 289-1182; Email: fred.bryant@lennoxind.com.
  - 3. Trane. Contact: Ammanda Nakamura, National Accounts Manager; Telephone (630) 734-3200; FAX: (630) 323-9040.
  - 4. YORK; a Johnson Controls company. Contact: Jeff Nieman, National Accounts Manager; Telephone: (800) 838-7219 (630) 279-0050; FAX: (630) 833-3113.

### 2.2 FANS

- A. Direct-Driven Supply-Air Fans: Double width,, centrifugal; with permanently lubricated, multispeed motor resiliently mounted in the fan inlet. Aluminum or painted-steel wheels, and galvanized- or painted-steel fan scrolls.
- B. Belt-Driven Supply-Air Fans: Double width, forward curved, centrifugal; with permanently lubricated, single-speed motor installed on an adjustable fan base resiliently mounted in the casing. Aluminum or painted-steel wheels, and galvanized- or painted-steel fan scrolls.
- C. Condenser-Coil Fan: Propeller, mounted on shaft of permanently lubricated motor.

## 2.3 COILS

- A. Supply-Air Refrigerant Coil:
  - 1. Copper-plate fin and seamless copper tube in steel casing with equalizing-type vertical distributor.
  - 2. Condensate Drain Pan: Galvanized steel with corrosion-resistant coating formed with pitch and drain connections.
- B. Outdoor-Air Refrigerant Coil:
  - 1. Copper-plate fin and seamless copper tube in steel casing with equalizing-type vertical distributor.
  - 2. Polymer strip shall prevent all copper coil from contacting steel coil frame or condensate pan.

## 2.4 REFRIGERANT CIRCUIT COMPONENTS

- A. Number of Refrigerant Circuits: One.
- B. Compressor: Hermetic, reciprocating, mounted on vibration isolators; with internal overcurrent and high-temperature protection, internal pressure relief.
- C. Refrigeration Specialties:
  - 1. Refrigerant: R-410A.
  - 2. Expansion valve with replaceable thermostatic element.
  - 3. Refrigerant filter/dryer.
  - 4. Manual-reset high-pressure safety switch.
  - 5. Automatic-reset low-pressure safety switch.
  - 6. Minimum off-time relay.
  - 7. Automatic-reset compressor motor thermal overload.
  - 8. Brass service valves installed in compressor suction and liquid lines.

## 2.5 AIR FILTRATION

- A. Minimum arrestance according to ASHRAE 52.1, and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2.
  - 1. Glass Fiber: Minimum percent arrestance, and MERV 8.

## 2.6 GAS FURNACE

- A. Description: Factory assembled, piped, and wired; complying with ANSI Z21.47 and NFPA 54.
- B. Power Vent: Integral, motorized centrifugal fan interlocked with gas valve.
- C. Safety Controls:
  - 1. Gas Control Valve: Single stage.

## 2.7 ELECTRICAL POWER CONNECTION

- A. Provide for single connection of power to unit with unit-mounted disconnect switch accessible from outside unit and control-circuit transformer with built-in overcurrent protection.

## 2.8 ACCESSORIES – Refer to Drawings

## PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of RTUs.
- B. Examine roughing-in for RTUs to verify actual locations of piping and duct connections before equipment installation.
- C. Examine roofs for suitable conditions where RTUs will be installed.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 INSTALLATION

- A. Roof Curb: Install on roof structure or level and secure. Install RTUs on curbs and coordinate roof penetrations and flashing with roof construction specified in Section 077200 "Roof Accessories." Secure RTUs to upper curb rail, and secure curb base to roof framing with anchor bolts.
- B. Unit Support: Install unit level on curbs. Coordinate wall penetrations and flashing with wall construction. Secure RTUs to structural support with anchor bolts.

## 3.3 CONNECTIONS

- A. Install condensate drain, minimum connection size, with trap and indirect connection to nearest roof drain or area drain.
- B. Install piping adjacent to RTUs to allow service and maintenance.
  - 1. Gas Piping: Comply with applicable requirements in Section 231123 "Facility Natural-Gas Piping." Connect gas piping to burner, full size of gas train inlet, and connect with union and shutoff valve with sufficient clearance for burner removal and service.
- C. Duct installation requirements are specified in other HVAC Sections. Drawings indicate the general arrangement of ducts. The following are specific connection requirements:
  - 1. Install ducts to termination at top of roof curb.
  - 2. Remove roof decking only as required for passage of ducts. Do not cut out decking under entire roof curb.
  - 3. Connect supply ducts to RTUs with flexible duct connectors specified in Section 233300 "Air Duct Accessories."
  - 4. Install return-air duct continuously through roof structure.

## 3.4 FIELD QUALITY CONTROL

- A. Tests and Inspections:
  - 1. After installing RTUs and after electrical circuitry has been energized, test units for compliance with requirements.

2. Inspect for and remove shipping bolts, blocks, and tie-down straps.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 237413

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 237413 – PACKAGED, OUTDOOR, CENTRAL-STATION AIR-HANDLING UNITS

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the packaged, outdoor, central-station air-handling units are installed and are in general conformance with the Contract Documents, applicable Codes, and shop drawings. The packaged, outdoor, central-station air-handling units have been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

PACKAGED, OUTDOOR, CENTRAL-STATION AIR-HANDLING UNIT INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_

## SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Building wires and cables rated 2000 V and less.
  - 2. Wires and cables for PV systems rated 2000 V and less.
  - 3. Connectors, splices, and terminations rated 2000 V and less.
- B. Related Requirements:
  - 1. Section 260523 "Control-Voltage Electrical Power Cables" for control systems communications cables and Classes 1, 2, and 3 control cables.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Product Schedule: Indicate type, use, location, and termination locations.

## 1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer's authorized service representative.
- B. Field quality-control reports.

## 1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA.
  - 1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

## PART 2 - PRODUCTS

## 2.1 CONDUCTORS AND CABLES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Alpha Wire Company.
  - 2. American Bare Conductor.
  - 3. Belden Inc.

## LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

4. Cerro Wire LLC.
  5. Encore Wire Corporation.
  6. General Cable Technologies Corporation.
  7. Service Wire Co.
  8. Southwire Company.
  9. WESCO.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
- D. Comply with UL 1277, UL 1685, and NFPA 70 for Type TC-ER cable used in VFC circuits.
- E. Conductors: Copper, complying with NEMA WC 70/ICEA S-95-658.
1. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THHN/THWN-2.
  2. PV Conductor Insulation: Comply with UL 4703.
- F. Cable: Comply with NEMA WC 70/ICEA S-95-658 for metal-clad cable, Type MC with ground wire.

## 2.2 CONNECTORS AND SPLICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. 3M Electrical Products.
  2. AFC Cable Systems; a part of Atkore International.
  3. Gardner Bender.
  4. Hubbell Power Systems, Inc.
  5. Ideal Industries, Inc.
  6. ILSCO.
  7. NSi Industries LLC.
  8. O-Z/Gedney; a brand of Emerson Industrial Automation.
  9. Service Wire Co.
  10. Thomas & Betts Corporation, A Member of the ABB Group.
  11. Tyco Electronics Corp.
- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

## PART 3 - EXECUTION

### 3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: All feeders shall be Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.



### 3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Service Entrance: Type THHN/THWN-2, single conductors in raceway.
- B. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN/THWN-2, single conductors in raceway.
- C. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.
- D. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway.
- E. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.
- F. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

### 3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
- B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.
- C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- F. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

### 3.4 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.

### 3.5 IDENTIFICATION

- A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."
- B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

### 3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

### 3.7 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

### 3.8 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform the following tests and inspections:
  - 1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.
  - 2. Perform each of the following visual and electrical tests:
    - a. Inspect exposed sections of conductor and cable for physical damage and correct connection according to the single-line diagram.
    - b. Test bolted connections for high resistance using one of the following:
      - 1) A low-resistance ohmmeter.
      - 2) Calibrated torque wrench.
      - 3) Thermographic survey.
    - c. Inspect compression applied connectors for correct cable match and indentation.
    - d. Inspect for correct identification.
    - e. Inspect cable jacket and condition.
    - f. Insulation-resistance test on each conductor with respect to ground and adjacent conductors. Apply a potential of 500-V dc for 300-V rated cable and 1000-V dc for 600-V rated cable for a one-minute duration.
    - g. Continuity test on each conductor and cable.
    - h. Uniform resistance of parallel conductors.
  - 3. Consider the cost and benefit of infrared scanning of cable and conductor splices before retaining "Initial Infrared Scanning" Subparagraph below.
  - 4. Initial Infrared Scanning: After Substantial Completion, but before Final Acceptance, perform an infrared scan of each splice in conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner. Correct deficiencies determined during the scan.
    - a. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

- b. Record of Infrared Scanning: Prepare a certified report that identifies switches checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.
- 5. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switch 11 months after date of Substantial Completion.
- C. Cables will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports to record the following:
  - 1. Procedures used.
  - 2. Results that comply with requirements.
  - 3. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

END OF SECTION 260519

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 260519 – LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the low-voltage electrical power conductors and cables are installed and are in general conformance with the Contract Documents, applicable Codes, and shop drawings. The low-voltage electrical power conductors and cables have been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

LOW-VOLTAGE ELECTRICAL POWER CONDUCTOR AND CABLE INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_

## SECTION 260523 - CONTROL-VOLTAGE ELECTRICAL POWER CABLES

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Multimode optical-fiber cabling.
  - 2. UTP cabling.
  - 3. RS-485 cabling.
  - 4. Low-voltage control cabling.
  - 5. Control-circuit conductors.
  - 6. Identification products.

## 1.3 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control and signaling power-limited circuits.
- C. Plenum: A space forming part of the air distribution system to which one or more air ducts are connected. An air duct is a passageway, other than a plenum, for transporting air to or from heating, ventilating, or air-conditioning equipment.
- D. UTP: Unshielded twisted pair.

## 1.4 ACTION SUBMITTALS

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

## 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified layout technician, installation supervisor, and field inspector.
- B. Source quality-control reports.

## 1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA or an NRTL.

## PART 2 - PRODUCTS

## 2.1 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

## 2.2 PERFORMANCE REQUIREMENTS

- A. Flame Travel and Smoke Density in Plenums: As determined by testing identical products according to NFPA 262 by a qualified testing agency. Identify products for installation in plenums with appropriate markings of applicable testing agency.
  - 1. Flame Travel Distance: 60 inches or less.
  - 2. Peak Optical Smoke Density: 0.5 or less.
  - 3. Average Optical Smoke Density: 0.15 or less.
- B. Flame Travel and Smoke Density for Riser Cables in Non-Plenum Building Spaces: As determined by testing identical products according to UL 1666.
- C. Flame Travel and Smoke Density for Cables in Non-Riser Applications and Non-Plenum Building Spaces: As determined by testing identical products according to UL 1685.

## 2.3 BACKBOARDS

- A. Description: Plywood, fire-retardant treated, size as indicated on drawings. Comply with requirements for plywood backing panels in Section 061000 "Rough Carpentry."
- B. Painting: Paint plywood on all sides and edges with flat latex paint, verify color with Construction Documents. Comply with requirements in Section 099000 "Painting and Coating."

## 2.4 OPTICAL-FIBER CABLE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. 3M.
  - 2. AMP NETCONNECT; a Tyco Electronics brand; a TE Connectivity Ltd. company.
  - 3. Belden CDT Networking Division/NORDX.
  - 4. Belden Inc.
  - 5. Berk-Tek; a Nexans company.
  - 6. CommScope, Inc.
  - 7. Corning Cable Systems.
  - 8. Emerson Connectivity Solutions.
  - 9. General Cable; General Cable Corporation.
  - 10. Mohawk; a division of Belden Networking, Inc.
  - 11. Nexans.
  - 12. Optical Connectivity Solutions Division.
  - 13. Siemon.
- B. Description: Multimode, 50/125-micrometer, 24-fiber, nonconductive, tight-buffer, optical-fiber cable.

1. Comply with ICEA S-83-596 for mechanical properties.
2. Comply with TIA-568-C.3 for performance specifications.
3. Comply with TIA-492AAAA-B for detailed specifications.
4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444, UL 1651, and NFPA 70 for the following types:
  - a. Plenum Rated, Nonconductive: Type OFNP, complying with NFPA 262.
  - b. Riser Rated, Nonconductive: Type OFNR or Type OFNP, complying with UL 1666.
  - c. General Purpose, Nonconductive: Type OFN or Type OFNG.
  - d. Plenum Rated, Conductive: Type OFCP or Type OFNP, complying with NFPA 262.
  - e. Riser Rated, Conductive: Type OFCR; or Type OFNR, Type OFCP, or Type OFNP; complying with UL 1666.
  - f. General Purpose, Conductive: Type OFC or Type OFCG; or Type OFC, Type OFN, Type OFCG, Type OFNG, Type OFCR, Type OFNR, Type OFCP, or Type OFNP.
5. Conductive cable shall be steel-armored type.
6. Maximum Attenuation: 3.5 dB/km at 850 nm; 1.5 dB/km at 1300 nm.
7. Minimum Modal Bandwidth: 160 MHz-km at 850 nm; 500 MHz-km at 1300 nm.

C. Jacket:

1. Jacket Color: Aqua for 50/125-micrometer cable.
2. Cable cordage jacket, fiber, unit, and group color shall be according to TIA-598-C.
3. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches (1000 mm).

## 2.5 OPTICAL-FIBER CABLE HARDWARE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. ADC.
  2. American Technology Systems Industries, Inc.
  3. Belden CDT Networking Division/NORDX.
  4. Belden Inc.
  5. Berk-Tek; a Nexans company.
  6. Corning Cable Systems.
  7. Dynacom Corporation.
  8. Hubbell Premise Wiring.
  9. Molex Premise Networks.
  10. Optical Connectivity Solutions Division.
  11. Panduit Corp.
  12. Siemon Co. (The).
- B. Cross-Connects and Patch Panels: Modular panels housing multiple-numbered, duplex cable connectors.
1. Number of Connectors per Field: One for each fiber of cable or cables assigned to field, plus spares and blank positions adequate to suit specified expansion criteria.
- C. Patch Cords: Factory-made, dual-fiber cables in 36-inch (900-mm) lengths.
- D. Cable Connecting Hardware:
1. Comply with Optical-Fiber Connector Intermateability Standards (FOCIS) specifications of TIA-604-2-B, TIA-604-3-B, and TIA/EIA-604-12. Comply with TIA-568-C.3.
  2. Quick-connect, simplex and duplex, Type SC connectors. Insertion loss of not more than 0.75 dB.

3. Type SFF connectors may be used in termination racks, panels, and equipment packages.

## 2.6 UTP CABLE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. 3M.
  2. ADC.
  3. Alpha Wire Company.
  4. AMP NETCONNECT; a Tyco Electronics brand; a TE Connectivity Ltd. company.
  5. Belden CDT Networking Division/NORDX.
  6. Berk-Tek; a Nexans company.
  7. CommScope, Inc.
  8. Draka USA.
  9. General Cable; General Cable Corporation.
  10. Genesis Cable Products; Honeywell International, Inc.
  11. KRONE Incorporated.
  12. Mohawk; a division of Belden Networking, Inc.
  13. Nexans.
  14. Siemon.
  15. Siemon Co. (The).
  16. Superior Essex Inc.
  17. SYSTIMAX Solutions; a CommScope Inc. brand.
- B. Description: 100-ohm, four-pair UTP, 24-pair UTP, formed into four-pair binder groups with no overall jacket.
  1. Comply with ICEA S-90-661 for mechanical properties of Category 5e cables.
  2. Comply with TIA-568-C.1 for performance specifications.
  3. Comply with TIA-568-C.2, Category 5e.
  4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with NEMA WC 66, NFPA 70 for the following types:
    - a. Communications, Plenum Rated: Type CMP complying with UL 1685 or Type CMP in listed plenum communications raceway.
    - b. Communications, Riser Rated: Type CMR complying with UL 1666.
    - c. Communications, General Purpose: Type CM or Type CMG.
    - d. Communications, Limited Purpose: Type CMX.

## 2.7 UTP CABLE HARDWARE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. ADC.
  2. American Technology Systems Industries, Inc.
  3. AMP NETCONNECT; a Tyco Electronics brand; a TE Connectivity Ltd. company.
  4. Belden CDT Networking Division/NORDX.
  5. Belden Inc.
  6. Corning Cable Systems.
  7. Dynacom Corporation.
  8. Hubbell Incorporated; Wiring Device-Kellems.
  9. Hubbell Premise Wiring.
  10. KRONE Incorporated.
  11. Leviton Manufacturing Co., Inc.
  12. Molex Premise Networks.



13. Panduit Corp.
  14. Siemon Co. (The).
- B. General Requirements for Cable Connecting Hardware: Comply with TIA/EIA-568-C.2, IDC type, with modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of same category or higher.
- C. Connecting Blocks: 110-style IDC for Category 5e. Provide blocks for the number of cables terminated on the block, plus 25 percent spare. Integral with connector bodies, including plugs and jacks where indicated.
- D. Cross-Connect: Modular array of connecting blocks arranged to terminate building cables and permit interconnection between cables.
1. Number of Terminals per Field: One for each conductor in assigned cables.
- E. Patch Panel: Modular panels housing multiple-numbered jack units with IDC-type connectors at each jack for permanent termination of pair groups of installed cables.
1. Number of Jacks per Field: One for each four-pair UTP cable indicated.
- F. Jacks and Jack Assemblies: 100-ohm, balanced, twisted-pair connector; four-pair, eight-position modular. Comply with TIA/EIA-568-C.1.
- G. Patch Cords: Factory-made, four-pair cables in 36-inch (900-mm) lengths; terminated with eight-position modular plug at each end.
1. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure Category 6 performance. Patch cords shall have latch guards to protect against snagging.
  2. Patch cords shall have color-coded boots for circuit identification.
- H. Workstation Outlets: Two port-connector assemblies mounted in single faceplate.
- I. Faceplates:
1. Metal Faceplate: complying with requirements in Section 262726 "Wiring Devices."
  2. For use with snap-in jacks accommodating any combination of UTP, optical-fiber, and coaxial work area cords.
    - a. Flush-mounted jacks, positioning the cord at a 45-degree angle.
- J. Legend:
1. Factory labeled by silk-screening or engraving for faceplates.
  2. Machine printed, in the field, using adhesive-tape label.
  3. Snap-in, clear-label covers and machine-printed paper inserts.
- 2.8 LOW-VOLTAGE CONTROL CABLE
- A. Paired Cable: NFPA 70, Type CMG.
1. One pair, twisted, No. 16 AWG, stranded (19x29) tinned-copper conductors.
  2. PVC insulation.
  3. Unshielded.
  4. PVC jacket.
  5. Flame Resistance: Comply with UL 1685.
- B. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.
1. One pair, twisted, No. 16 AWG, stranded (19x29) tinned-copper conductors.
  2. PVC insulation.

3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with NFPA 262.

## 2.9 CONTROL-CIRCUIT CONDUCTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Encore Wire Corporation.
  2. General Cable; General Cable Corporation.
  3. Service Wire Co.
  4. Southwire Company.
- B. Class 1 Control Circuits: Stranded copper, Type THHN-2-THWN-2, in raceway, complying with UL 44.
- C. Class 2 Control Circuits: Stranded copper, Type THHN-2-THWN-2, complying with UL 44.
- D. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type THHN-2-THWN-2, in raceway, complying with UL 44.
- E. Class 2 Control Circuits and Class 3 Remote-Control and Signal Circuits That Supply Critical Circuits: Circuit Integrity (CI) cable.
  1. Smoke control signaling and control circuits.

## 2.10 SOURCE QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to evaluate cables.
- B. Factory test UTP cables according to TIA-568-C.2.
- C. Factory test optical-fiber cables according to TIA-568-C.3.
- D. Cable will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Test cables on receipt at Project site.
  1. Test optical-fiber cable on reels. Use an optical time domain reflectometer to verify the cable length and locate cable defects, splices, and connector; include the loss value of each. Retain test data and include the record in maintenance data.
  2. Test each pair of UTP cable for open and short circuits.

### 3.2 INSTALLATION OF RACEWAYS AND BOXES

- A. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems" for raceway selection and installation requirements for boxes, conduits, and wireways as supplemented or modified in this Section.
  - 1. Outlet boxes shall be no smaller than 2 inches (50 mm) wide, 3 inches (75 mm) high, and 2-1/2 inches (64 mm) deep.
  - 2. Outlet boxes for optical-fiber cables shall be no smaller than 4 inches (102 mm) square by 1-1/2 inches (38 mm) deep with extension ring sized to bring edge of ring to within 1/8 inch (3.1 mm) of the finished wall surface.
  - 3. Flexible metal conduit shall not be used.
- B. Comply with TIA-569-B for pull-box sizing and length of conduit and number of bends between pull points.
- C. Install manufactured conduit sweeps and long-radius elbows if possible.
- D. Raceway Installation in Equipment Rooms:
  - 1. Position conduit ends adjacent to a corner on backboard if a single piece of plywood is installed, or in the corner of the room if multiple sheets of plywood are installed around perimeter walls of the room.
  - 2. Install cable trays to route cables if conduits cannot be located in these positions.
  - 3. Secure conduits to backboard if entering the room from overhead.
  - 4. Extend conduits 3 inches (75 mm) above finished floor.
  - 5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.
- E. Backboards: Install backboards with 96-inch (2440-mm) dimension vertical. Butt adjacent sheets tightly and form smooth gap-free corners and joints.

### 3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Comply with NECA 1 and NFPA 70.
- B. General Requirements for Cabling:
  - 1. Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems" and Ch. 6, "Optical Fiber Structured Cabling Systems."
  - 2. Terminate all conductors and optical fibers; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels.
  - 3. Cables may not be spliced.
  - 4. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
  - 5. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems" and Ch. 6, "Optical Fiber Structured Cabling Systems." Install lacing bars and distribution spools.
  - 6. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
  - 7. Cold-Weather Installation: Bring cable to room temperature before dereeling. Do not use heat lamps for heating.

8. Pulling Cable: Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems" and Ch. 6, "Optical Fiber Structured Cabling Systems." Monitor cable pull tensions.
  9. Support: Do not allow cables to lay on removable ceiling tiles.
  10. Secure: Fasten securely in place with hardware specifically designed and installed so as to not damage cables.
- C. UTP Cable Installation:
1. Comply with TIA-568-C.2.
  2. Install termination hardware.
  3. Do not untwist UTP cables more than 1/2 inch (12 mm) at the point of termination to maintain cable geometry.
- D. Installation of Control-Circuit Conductors:
1. Install wiring in raceways. Comply with requirements specified in Section 260533 "Raceways and Boxes for Electrical Systems."
- E. Optical-Fiber Cable Installation:
1. Comply with TIA-568-C.3.
  2. Terminate cable on connecting hardware that is rack or cabinet mounted.
- F. Open-Cable Installation:
1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
  2. Suspend copper cable not in a wireway or pathway a minimum of 8 inches (200 mm) above ceilings by cable supports not more than 30 inches (760 mm) apart.
  3. Cable shall not be run through or on structural members or in contact with pipes, ducts, or other potentially damaging items. Do not run cables between structural members and corrugated panels.
- G. Installation of Cable Routed Exposed under Raised Floors:
1. Install plenum-rated cable only.
  2. Install cabling after the flooring system has been installed in raised floor areas.
  3. Below each feed point, neatly coil a minimum of 72 inches (1830 mm) of cable in a coil not less than 12 inches (305 mm) in diameter.
- H. Separation from EMI Sources:
1. Comply with BICSI TDMM and TIA-569-B recommendations for separating unshielded copper voice and data communications cable from potential EMI sources including electrical power lines and equipment.
  2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
    - a. Electrical Equipment or Circuit Rating Less Than 2 kVA: A minimum of 5 inches (127 mm).
    - b. Electrical Equipment or Circuit Rating between 2 and 5 kVA: A minimum of 12 inches (305 mm).
    - c. Electrical Equipment or Circuit Rating More Than 5 kVA: A minimum of 24 inches (600 mm).
  3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
    - a. Electrical Equipment or Circuit Rating Less Than 2 kVA: A minimum of 2-1/2 inches (64 mm).
    - b. Electrical Equipment or Circuit Rating between 2 and 5 kVA: A minimum of 6 inches (150 mm).
    - c. Electrical Equipment or Circuit Rating More Than 5 kVA: A minimum of 12 inches (305 mm).

4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
  - a. Electrical Equipment or Circuit Rating Less Than 2 kVA: No requirement.
  - b. Electrical Equipment or Circuit Rating between 2 and 5 kVA: A minimum of 3 inches (75 mm).
  - c. Electrical Equipment or Circuit Rating More Than 5 kVA: A minimum of 6 inches (150 mm).
5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or 5 HP and Larger: A minimum of 48 inches (1200 mm).
6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches (127 mm).

### 3.4 REMOVAL OF CONDUCTORS AND CABLES

- A. Remove abandoned conductors and cables. Abandoned conductors and cables are those installed that are not terminated at equipment and are not identified for future use with a tag.

### 3.5 CONTROL-CIRCUIT CONDUCTORS

- A. Minimum Conductor Sizes:
  1. Class 1 remote-control and signal circuits; No 14 AWG.
  2. Class 2 low-energy, remote-control, and signal circuits; No. 16 AWG.
  3. Class 3 low-energy, remote-control, alarm, and signal circuits; No 12 AWG.

### 3.6 FIRESTOPPING

- A. Comply with requirements in Section 078413 "Penetration Firestopping."
- B. Comply with TIA-569-B, Annex A, "Firestopping."
- C. Comply with BICSI TDMM, "Firestopping" Chapter.

### 3.7 GROUNDING

- A. For data communication wiring, comply with ANSI-J-STD-607-A and with BICSI TDMM, "Bonding and Grounding (Earthing)" Chapter.
- B. For low-voltage control wiring and cabling, comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

### 3.8 IDENTIFICATION

- A. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- B. Identify data and communications system components, wiring, and cabling according to TIA-606-A; label printers shall use label stocks, laminating adhesives, and inks complying with UL 969.

## 3.9 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Perform the following tests and inspections:
  - 1. Visually inspect UTP and optical-fiber cable jacket materials for UL or third-party certification markings. Inspect cabling terminations to confirm color-coding for pin assignments, and inspect cabling connections to confirm compliance with TIA-568-C.1.
  - 2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
  - 3. Test UTP cabling for direct-current loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not after cross-connection.
    - a. Test instruments shall meet or exceed applicable requirements in TIA-568-C.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
  - 4. Optical-Fiber Cable Tests:
    - a. Test instruments shall meet or exceed applicable requirements in TIA-568-C.0. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
    - b. Link End-to-End Attenuation Tests:
      - 1) Multimode Link Measurements: Test at 850 or 1300 nm in one direction according to TIA/EIA-526-14-A, Method B, One Reference Jumper.
      - 2) Attenuation test results for links shall be less than 2.0 dB.
- D. Document data for each measurement. Print data for submittals in a summary report that is formatted using Table 10.1 in BICSI TDMM as a guide, or transfer the data from the instrument to the computer, save as text files, print, and submit.
- E. End-to-end cabling will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.

END OF SECTION 260523

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 260523 – CONTROL-VOLTAGE ELECTRICAL POWER CABLES

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the control-voltage electrical power cables are installed and are in general conformance with the Contract Documents, applicable Codes, and shop drawings. The control-voltage electrical power cables have been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

CONTROL-VOLTAGE ELECTRICAL POWER CABLE INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_





## SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section includes grounding and bonding systems and equipment.

## 1.3 ACTION SUBMITTALS

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

## 1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency and testing agency's field supervisor.
- B. Field quality-control reports.

## 1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.

## 1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA or an NRTL.
  - 1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with UL 467 for grounding and bonding materials and equipment.

## PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Burndy; Part of Hubbell Electrical Systems.
2. Dossert; AFL Telecommunications LLC.
3. ERICO International Corporation.
4. Fushi Copperweld Inc.
5. Galvan Industries, Inc.; Electrical Products Division, LLC.
6. Harger Lightning & Grounding.
7. ILSCO.
8. O-Z/Gedney; a brand of Emerson Industrial Automation.
9. Robbins Lightning, Inc.
10. Siemens Power Transmission & Distribution, Inc.
11. Thomas & Betts Corporation, A Member of the ABB Group.

## 2.2 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

## 2.3 CONDUCTORS

- A. Insulated Conductors: **Copper or tinned-copper** wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
  1. Solid Conductors: ASTM B 3.
  2. Stranded Conductors: ASTM B 8.
  3. Tinned Conductors: ASTM B 33.
  4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
  5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
  6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
  7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
- C. Grounding Bus: Predrilled rectangular bars of annealed copper, **1/4 by 4 inches (6.3 by 100 mm)** in cross section, with 9/32-inch (7.14-mm) holes spaced 1-1/8 inches (28 mm) apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.

## 2.4 CONNECTORS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

- D. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless **compression**-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

## 2.5 GROUNDING ELECTRODES

- A. Ground Rods: **Copper-clad** steel, **sectional type; 3/4 inch by 10 feet.**

## PART 3 - EXECUTION

### 3.1 APPLICATIONS

- A. Conductors: Install solid conductor for **No. 8** AWG and smaller, and stranded conductors for **No. 6** AWG and larger unless otherwise indicated.
- B. Underground Grounding Conductors: Install bare **tinned-copper** conductor, **No. 2/0** AWG minimum.
  - 1. Bury at least 24 inches (600 mm) below grade.
- C. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.

### 3.2 GROUNDING AT THE SERVICE

- A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

### 3.3 GROUNDING SEPARATELY DERIVED SYSTEMS

- A. Generator: Install grounding electrode(s) at the generator location. The electrode shall be connected to the equipment grounding conductor and to the frame of the generator.

### 3.4 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

- A. Comply with IEEE C2 grounding requirements.
- B. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches (100 mm) will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches (50 mm) above to 6 inches (150 mm) below concrete. Seal floor opening with waterproof, nonshrink grout.

- C. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields according to written instructions by manufacturer of splicing and termination kits.

### 3.5 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.
- C. Water Heater: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.
- D. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.
- E. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.
- F. Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

### 3.6 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.
- C. Ground Rods: Drive rods until tops are 2 inches (50 mm) below finished floor or final grade unless otherwise indicated.
  - 1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.

2. For grounding electrode system, install at least **three** rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.
- D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
  1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
  2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
  3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.
- E. Grounding and Bonding for Piping:
  1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
  2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
  3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.
- F. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet (18 m) apart.
- G. Ground Ring: Install a grounding conductor, electrically connected to each building structure ground rod and to each **steel column**, extending around the perimeter of **building**.
  1. Install tinned-copper conductor not less than **No. 2/0** AWG for ground ring and for taps to building steel.
  2. Bury ground ring not less than **24 inches (600 mm)** from building's foundation.
- H. Concrete-Encased Grounding Electrode (Ufer Ground): Fabricate according to NFPA 70; using electrically conductive coated steel reinforcing bars or rods, at least 20 feet (6.0 m) long. If reinforcing is in multiple pieces, connect together by the usual steel tie wires or exothermic welding to create the required length.

### 3.7 FIELD QUALITY CONTROL

- A. Testing Agency: **Engage** a qualified testing agency to perform tests and inspections.
- B. Perform tests and inspections.
- C. Tests and Inspections:
  1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
  2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.

3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, **at ground test wells, and at individual ground rods**. Make tests at ground rods before any conductors are connected.
  - a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
  - b. Perform tests by fall-of-potential method according to IEEE 81.
- D. Grounding system will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.
- F. Report measured ground resistances that exceed the following values:
  1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: **10** ohms.
  2. Power Distribution Units or Panelboards Serving Electronic Equipment: **1** ohm(s).
  3. Manhole Grounds: **10** ohms.
- G. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 260526 – GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the grounding and bonding for electrical systems is installed and is in general conformance with the Contract Documents, applicable Codes, and shop drawings. The grounding and bonding for electrical systems have been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_





## SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Hangers and supports for electrical equipment and systems.
  - 2. Construction requirements for concrete bases.
- B. Related Requirements:
  - 1. Section 260548.16 "Seismic Controls for Electrical Systems" for products and installation requirements necessary for compliance with seismic criteria.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
    - a. Hangers.
    - b. Steel slotted support systems.
    - c. Nonmetallic support systems.
    - d. Trapeze hangers.
    - e. Clamps.
    - f. Turnbuckles.
    - g. Sockets.
    - h. Eye nuts.
    - i. Saddles.
    - j. Brackets.
  - 2. Include rated capacities and furnished specialties and accessories.
- B. Shop Drawings: For fabrication and installation details for electrical hangers and support systems.
  - 1. Trapeze hangers. Include product data for components.
  - 2. Steel slotted-channel systems.
  - 3. Nonmetallic slotted-channel systems.
  - 4. Equipment supports.
  - 5. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling 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. Suspended ceiling components.
  - 2. Structural members to which hangers and supports will be attached.
  - 3. Size and location of initial access modules for acoustical tile.
  - 4. Items penetrating finished ceiling, including the following:
    - a. Lighting fixtures.
    - b. Air outlets and inlets.
    - c. Speakers.
    - d. Sprinklers.
    - e. Access panels.
- B. Seismic Qualification Certificates: For hangers and supports for electrical equipment and systems, accessories, and components, from manufacturer.
  - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
  - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
  - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

#### 1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design hanger and support system.
- B. Seismic Performance: Hangers and supports shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
  - 1. The term "withstand" means "the supported equipment and systems will remain in place without separation of any parts when subjected to the seismic forces specified."
  - 2. Component Importance Factor: 1.5.
- C. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Flame Rating: Class 1.
  - 2. Self-extinguishing according to ASTM D 635.

#### 2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4 factory-fabricated components for field assembly.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Allied Tube & Conduit; a part of Atkore International.
    - b. B-line, an Eaton business.
    - c. ERICO International Corporation.
    - d. Flex-Strut Inc.
    - e. GS Metals Corp.
    - f. G-Strut.
    - g. Haydon Corporation.
    - h. Metal Ties Innovation.
    - i. Thomas & Betts Corporation, A Member of the ABB Group.
    - j. Unistrut; Part of Atkore International.
    - k. Wesanco, Inc.
  2. Material: Galvanized steel.
  3. Channel Width: 1-5/8 inches (41.25 mm).
  4. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
  5. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
  6. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
  7. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
  8. Channel Dimensions: Selected for applicable load criteria.
- B. Aluminum Slotted Support Systems: Comply with MFMA-4 factory-fabricated components for field assembly.
1. Channel Width: [1-5/8 inches (41.25 mm)] [1-1/4 inches (31.75 mm)] [13/16 inches (20.64 mm)] <Insert size>.
  2. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
  3. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
  4. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
  5. Channel Dimensions: Selected for applicable load criteria.
- C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be made of malleable iron.
- E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M steel plates, shapes, and bars; black and galvanized.
- F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
    - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) Hilti, Inc.

- 2) ITW Ramset/Red Head; Illinois Tool Works, Inc.
  - 3) MKT Fastening, LLC.
  - 4) Simpson Strong-Tie Co., Inc.
2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
  - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - 1) B-line, an Eaton business.
    - 2) Empire Tool and Manufacturing Co., Inc.
    - 3) Hilti, Inc.
    - 4) ITW Ramset/Red Head; Illinois Tool Works, Inc.
    - 5) MKT Fastening, LLC.
3. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

## 2.3 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
- B. Materials: Comply with requirements in Section 055000 "Metal Fabrications" for steel shapes and plates.

## PART 3 - EXECUTION

### 3.1 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems unless requirements in this Section are stricter.
- B. Comply with requirements for raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."
- C. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMTs, IMCs, and RMCs as required by NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.
- D. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted [or other ]support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
  1. Secure raceways and cables to these supports with two-bolt conduit clamps.
- E. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch (38-mm) and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

### 3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, EMTs, IMCs, and RMCs may be supported by openings through structure members, according to NFPA 70.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).
- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
  - 1. To Wood: Fasten with lag screws or through bolts.
  - 2. To New Concrete: Bolt to concrete inserts.
  - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
  - 4. To Existing Concrete: Expansion anchor fasteners.
  - 5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches (100 mm) thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches (100 mm) thick.
  - 6. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts.
  - 7. To Light Steel: Sheet metal screws.
  - 8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that comply with seismic-restraint strength and anchorage requirements.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

### 3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements in Section 055000 "Metal Fabrications" for site-fabricated metal supports.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M.

### 3.4 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated but not less than 4 inches (100 mm) larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

- B. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Section 033000 "Cast-in-Place Concrete."
- C. Anchor equipment to concrete base as follows:
  - 1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 2. Install anchor bolts to elevations required for proper attachment to supported equipment.
  - 3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

### 3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
  - 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).
- B. Touchup: Comply with requirements in Section 099000 "Painting and Coating" for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 260529

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 260529 – HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the hangers and supports for electrical systems are installed and are in general conformance with the Contract Documents, applicable Codes, and shop drawings. The hangers and supports for electrical systems have been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEM INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_





## SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Metal conduits, tubing, and fittings.
  - 2. Nonmetal conduits, tubing, and fittings.
  - 3. Metal wireways and auxiliary gutters.
  - 4. Nonmetal wireways and auxiliary gutters.
  - 5. Surface raceways.
  - 6. Boxes, enclosures, and cabinets.
  - 7. Handholes and boxes for exterior underground cabling.

## 1.3 DEFINITIONS

- A. ARC: Aluminum rigid conduit.
- B. GRC: Galvanized rigid steel conduit.
- C. IMC: Intermediate metal conduit.

## 1.4 ACTION SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

## PART 2 - PRODUCTS

## 2.1 METAL CONDUITS, TUBING, AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. AFC Cable Systems; a part of Atkore International.
  - 2. Allied Tube & Conduit; a part of Atkore International.
  - 3. Anamet Electrical, Inc.
  - 4. Electri-Flex Company.
  - 5. FSR Inc.
  - 6. O-Z/Gedney; a brand of Emerson Industrial Automation.
  - 7. Picoma Industries, Inc.
  - 8. Republic Conduit.

9. Robroy Industries.
  10. Southwire Company.
  11. Thomas & Betts Corporation, A Member of the ABB Group.
  12. Western Tube and Conduit Corporation.
  13. Wheatland Tube Company.
- B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. GRC: Comply with ANSI C80.1 and UL 6.
- D. IMC: Comply with ANSI C80.6 and UL 1242.
- E. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.
1. Comply with NEMA RN 1.
  2. Coating Thickness: 0.040 inch (1 mm), minimum.
- F. EMT: Comply with ANSI C80.3 and UL 797.
- G. FMC: Comply with UL 1; zinc-coated steel.
- H. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.
- I. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
  2. Fittings for EMT:
    - a. Material: Steel.
    - b. Type: Setscrew.
  3. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
  4. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.
- J. Joint Compound for IMC or GRC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

## 2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. AFC Cable Systems; a part of Atkore International.
  2. Anamet Electrical, Inc.
  3. Arnco Corporation.
  4. CANTEX INC.
  5. CertainTeed Corporation.
  6. Condux International, Inc.
  7. Electri-Flex Company.
  8. Kraloy.
  9. Lamson & Sessions.
  10. Niedax Inc.
  11. RACO; Hubbell.
  12. Thomas & Betts Corporation, A Member of the ABB Group.

- B. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. ENT: Comply with NEMA TC 13 and UL 1653.
- D. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
- E. LFNC: Comply with UL 1660.
- F. Rigid HDPE: Comply with UL 651A.
- G. Continuous HDPE: Comply with UL 651B.
- H. Coilable HDPE: Preassembled with conductors or cables, and complying with ASTM D 3485.
- I. RTRC: Comply with UL 1684A and NEMA TC 14.
- J. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
- K. Fittings for LFNC: Comply with UL 514B.
- L. Solvents and Adhesives: As recommended by conduit manufacturer.

## 2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. B-line, an Eaton business.
  - 2. Hoffman; a brand of Pentair Equipment Protection.
  - 3. MonoSystems, Inc.
  - 4. Square D.
- B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 3R> unless otherwise indicated, and sized according to NFPA 70.
  - 1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- D. Wireway Covers: Hinged type unless otherwise indicated.
- E. Finish: Manufacturer's standard enamel finish.

## 2.4 SURFACE RACEWAYS

- A. Listing and Labeling: Surface raceways and tele-power poles shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

- B. Surface Metal Raceways: Galvanized steel with snap-on covers complying with UL 5. Manufacturer's standard enamel finish in color selected by Architect.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Hubbell Incorporated; Wiring Device-Kellems.
    - b. MonoSystems, Inc.
    - c. Panduit Corp.
    - d. Wiremold / Legrand.
- C. Surface Nonmetallic Raceways: Two- or three-piece construction, complying with UL 5A, and manufactured of rigid PVC with texture and color selected by Architect from manufacturer's standard colors. Product shall comply with UL 94 V-0 requirements for self-extinguishing characteristics.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Hubbell Incorporated.
    - b. MonoSystems, Inc.
    - c. Panduit Corp.
    - d. Wiremold / Legrand.
- D. Tele-Power Poles:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. MonoSystems, Inc.
    - b. Panduit Corp.
    - c. Wiremold / Legrand.
  - 2. Material: Galvanized steel with ivory baked-enamel finish.
  - 3. Fittings and Accessories: Dividers, end caps, covers, cutouts, wiring harnesses, devices, mounting materials, and other fittings shall match and mate with tele-power pole as required for complete system.

## 2.5 BOXES, ENCLOSURES, AND CABINETS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Adalet.
  - 2. Crouse-Hinds, an Eaton business.
  - 3. EGS/Appleton Electric.
  - 4. Erickson Electrical Equipment Company.
  - 5. FSR Inc.
  - 6. Hoffman; a brand of Pentair Equipment Protection.
  - 7. Hubbell Incorporated.
  - 8. Kraloy.
  - 9. Milbank Manufacturing Co.
  - 10. MonoSystems, Inc.
  - 11. Oldcastle Enclosure Solutions.
  - 12. O-Z/Gedney; a brand of Emerson Industrial Automation.
  - 13. RACO; Hubbell.
  - 14. Robroy Industries.
  - 15. Spring City Electrical Manufacturing Company.
  - 16. Stahlin Non-Metallic Enclosures.
  - 17. Thomas & Betts Corporation, A Member of the ABB Group.
  - 18. Wiremold / Legrand.

- B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
- C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
- D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.
- E. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.
- F. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb (23 kg). Outlet boxes designed for attachment of luminaires weighing more than 50 lb (23 kg) shall be listed and marked for the maximum allowable weight.
- G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- H. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.
- I. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
- J. Device Box Dimensions: 4 inches square by 2-1/8 inches deep (100 mm square by 60 mm deep).
- K. Gangable boxes are allowed.
- L. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 with continuous-hinge cover with flush latch unless otherwise indicated.
  - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
  - 2. Nonmetallic Enclosures: Plastic.
  - 3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.
- M. Cabinets:
  - 1. NEMA 250, Type 1 galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
  - 2. Hinged door in front cover with flush latch and concealed hinge.
  - 3. Key latch to match panelboards.
  - 4. Metal barriers to separate wiring of different systems and voltage.
  - 5. Accessory feet where required for freestanding equipment.
  - 6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

## 2.6 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

- A. General Requirements for Handholes and Boxes:
  - 1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
  - 2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Armorcast Products Company.
  - b. Carson Industries LLC.
  - c. NewBasis.
  - d. Oldcastle Precast, Inc.
  - e. Quazite: Hubbell Power Systems, Inc.
  - f. Synertech Moulded Products.
2. Standard: Comply with SCTE 77.
3. Configuration: Designed for flush burial with open] bottom unless otherwise indicated.
4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
6. Cover Legend: Molded lettering, "ELECTRIC."
7. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
8. Handholes 12 Inches Wide by 24 Inches Long (300 mm Wide by 600 mm Long) and Larger: Have inserts for cable racks and pulling-in irons installed before concrete is poured.

## 2.7 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES

- A. Handhole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.
  1. Tests of materials shall be performed by an independent testing agency.
  2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
  3. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012 and traceable to NIST standards.

## PART 3 - EXECUTION

### 3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
  1. Exposed Conduit: GRC.
  2. Concealed Conduit, Aboveground: GRC.
  3. Underground Conduit: RNC, Type EPC-40-PVC.
  4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
  5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.
- B. Indoors: Apply raceway products as specified below unless otherwise indicated:
  1. Exposed, Not Subject to Physical Damage: EMT.
  2. Exposed, Not Subject to Severe Physical Damage: EMT.
  3. Exposed and Subject to Severe Physical Damage: GRC.
  4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
  5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
  6. Damp or Wet Locations: GRC.

7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.
- C. Minimum Raceway Size: 3/4-inch (21-mm) trade size.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
  1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
  2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
  3. EMT: Use setscrew, steel fittings. Comply with NEMA FB 2.10.
  4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.
- E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.
- F. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.
- G. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F (49 deg C).

### 3.2 INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- B. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- C. Complete raceway installation before starting conductor installation.
- D. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.
- E. Arrange stub-ups so curved portions of bends are not visible above finished slab.
- F. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches (300 mm) of changes in direction.
- G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- H. Support conduit within 12 inches ((300 mm)) of enclosures to which attached.
- I. Raceways Embedded in Slabs:
  1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot ((3-m)) intervals.

2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
  3. Arrange raceways to keep a minimum of 1 inch (25 mm) of concrete cover in all directions.
  4. Do not embed threadless fittings in concrete unless specifically approved by Engineer of Record for each specific location.
  5. Change from ENT to RNC, Type EPC-40-PVC, before rising above floor.
- J. Stub-ups to Above Recessed Ceilings:
1. Use EMT, IMC, or RMC for raceways.
  2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
- K. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- L. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.
- M. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.
- N. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.
- O. Cut conduit perpendicular to the length. For conduits 2-inch (53-mm) trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.
- P. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
- Q. Surface Raceways:
1. Install surface raceway with a minimum 2-inch (50-mm) radius control at bend points.
  2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches (1200 mm) and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.
- R. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.
- S. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
1. Where conduits pass from warm to cold locations.
  2. Where an underground service raceway enters a building or structure.
  3. Where otherwise required by NFPA 70.
- T. Comply with manufacturer's written instructions for solvent welding RNC and fittings.



- U. Expansion-Joint Fittings:
  - 1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F (17 deg C) and that has straight-run length that exceeds 25 feet (7.6 m). Install in each run of aboveground RMC and EMT conduit that is located where environmental temperature change may exceed 100 deg F (55 deg C) and that has straight-run length that exceeds 100 feet (30 m).
  - 2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
    - a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F (70 deg C) temperature change.
    - b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F (86 deg C) temperature change.
    - c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F (70 deg C) temperature change.
  - 3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F (0.06 mm per meter of length of straight run per deg C) of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F (0.0115 mm per meter of length of straight run per deg C) of temperature change for metal conduits.
  - 4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
  - 5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
- V. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches (1830 mm) of flexible conduit for recessed and semirecessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
  - 1. Use LFMC in damp or wet locations subject to severe physical damage.
  - 2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.
- W. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.
- X. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.
- Y. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
- Z. Locate boxes so that cover or plate will not span different building finishes.
- AA. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.
- BB. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.
- CC. Set metal floor boxes level and flush with finished floor surface.
- DD. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

### 3.3 INSTALLATION OF UNDERGROUND CONDUIT

- A. Direct-Buried Conduit:
  - 1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 310020 "Earthwork" for pipe less than 6 inches (150 mm) in nominal diameter.
  - 2. Install backfill as specified in Section 310020 "Earthwork."
  - 3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches (300 mm) of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 310020 "Earthwork."
  - 4. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.
    - a. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.
  - 5. Underground Warning Tape: Comply with requirements in Section 260553 "Identification for Electrical Systems."

### 3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.
- B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch (12.5-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.
- C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch (25 mm) above finished grade.
- D. Install handholes with bottom below frost line.
- E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables but short enough to preserve adequate working clearances in enclosure.
- F. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

### 3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.6 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
  - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
  - 2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 260533 – RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the raceways and boxes for electrical systems are installed and are in general conformance with the Contract Documents, applicable Codes, and shop drawings. The raceways and boxes for electrical systems have been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEM INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_

## SECTION 260544 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
  - 2. Sleeve-seal systems.
  - 3. Sleeve-seal fittings.
  - 4. Grout.
  - 5. Silicone sealants.
- B. Related Requirements:
  - 1. Section 078413 "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

## 1.3 ACTION SUBMITTALS

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

## PART 2 - PRODUCTS

## 2.1 SLEEVES

- A. Wall Sleeves:
  - 1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
- B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.
- C. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.
- D. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.
- E. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.
- F. Sleeves for Rectangular Openings:
  - 1. Material: Galvanized sheet steel.

## SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

2. Minimum Metal Thickness:
  - a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and with no side larger than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
  - b. For sleeve cross-section rectangle perimeter 50 inches (1270 mm) or more and one or more sides larger than 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

## 2.2 SLEEVE-SEAL SYSTEMS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Advance Products & Systems, Inc.
    - b. CALPICO, Inc.
    - c. Metraflex Company (The).
    - d. Pipeline Seal and Insulator, Inc.
    - e. Proco Products, Inc.
  2. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
  3. Pressure Plates: Carbon steel.
  4. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

## 2.3 SLEEVE-SEAL FITTINGS

- A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.
  1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. HOLDRITE.

## 2.4 GROUT

- A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.
- B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- C. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

## 2.5 SILICONE SEALANTS

- A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.
- B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

### PART 3 - EXECUTION

#### 3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

- A. Comply with NECA 1.
- B. Comply with NEMA VE 2 for cable tray and cable penetrations.
- C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:
  1. Interior Penetrations of Non-Fire-Rated Walls and Floors:
    - a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."
    - b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.
  2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
  3. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.
  4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
  5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches (50 mm)] above finished floor level. Install sleeves during erection of floors.
- D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:
  1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
  2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.
- E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

### 3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.
- B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

### 3.3 SLEEVE-SEAL-FITTING INSTALLATION

- A. Install sleeve-seal fittings in new walls and slabs as they are constructed.
- B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.
- C. Secure nailing flanges to concrete forms.
- D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION 260544



CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 260544 – SLEEVES AND SLEEVE SEALS FOR ELECTRICAL  
RACEWAYS AND CABLING

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the sleeves and sleeve seals for electrical raceways and cabling are installed and are in general conformance with the Contract Documents, applicable Codes, and shop drawings. The sleeves and sleeve seals for electrical raceways and cabling have been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_



## SECTION 260548.16 - SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Restraint channel bracings.
  - 2. Restraint cables.
  - 3. Seismic-restraint accessories.
  - 4. Mechanical anchor bolts.
  - 5. Adhesive anchor bolts.
- B. Related Requirements:
  - 1. Section 260529 "Hangers and Supports for Electrical Systems" for commonly used electrical supports and installation requirements.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.
    - a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an evaluation service member of ICC-ES.
    - b. Annotate to indicate application of each product submitted and compliance with requirements.
  - 2. Seismic- and Wind-Restraint Details:
    - a. Design Analysis: To support selection and arrangement of seismic and wind restraints. Include calculations of combined tensile and shear loads.
    - b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.
    - c. Coordinate seismic-restraint and vibration isolation details with wind-restraint details required for equipment mounted outdoors. Comply with requirements in other Sections for equipment mounted outdoors.
    - d. Preapproval and Evaluation Documentation: By an agency acceptable to authorities having jurisdiction, showing maximum ratings of restraint items and the basis for approval (tests or calculations).

#### 1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory as defined by OSHA in 29 CFR 1910.7 and that is acceptable to authorities having jurisdiction.
- B. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.
- C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- D. Seismic-restraint devices shall have horizontal and vertical load testing and analysis. They shall bear anchorage preapproval from OSHPD in addition to preapproval, showing maximum seismic-restraint ratings, by ICC-ES or another agency acceptable to authorities having jurisdiction. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) that support seismic-restraint designs must be signed and sealed by a qualified professional engineer.
- E. Comply with NFPA 70.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Wind-Restraint Loading:
  - 1. Basic Wind Speed: Coordinate with local requirements.
  - 2. Building Classification Category: Refer to architectural specifications.
  - 3. Minimum 10 lb/sq. ft. (48.8 kg/sq. m) multiplied by maximum area of HVAC component projected on vertical plane normal to wind direction and 45 degrees either side of normal.
- B. Seismic-Restraint Loading:
  - 1. Site Class as Defined in the IBC: Refer to architectural specifications.
  - 2. Assigned Seismic Use Group or Building Category as Defined in the IBC: Refer to architectural specifications.
    - a. Component Importance Factor: 1.0.
    - b. Component Response Modification Factor: 1.5.
    - c. Component Amplification Factor: 1.0.
  - 3. Design Spectral Response Acceleration at Short Periods (0.2 Second): Coordinate with structural design.
  - 4. Design Spectral Response Acceleration at 1.0-Second Period: Coordinate with structural design.

#### 2.2 RESTRAINT CHANNEL BRACINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. B-line, an Eaton business.
  - 2. Hilti, Inc.
  - 3. Mason Industries, Inc.
  - 4. Unistrut; Part of Atkore International.

- B. Description: MFMA-4, shop- or field-fabricated bracing assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end, with other matching components, and with corrosion-resistant coating; rated in tension, compression, and torsion forces.

## 2.3 RESTRAINT CABLES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Kinetics Noise Control, Inc.
  - 2. Loos & Co., Inc.
  - 3. Vibration Mountings & Controls, Inc.
- B. Restraint Cables: ASTM A 603 galvanized-steel cables. End connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for restraining cable service; with a minimum of two clamping bolts for cable engagement.

## 2.4 SEISMIC-RESTRAINT ACCESSORIES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. B-line, an Eaton business.
  - 2. Kinetics Noise Control, Inc.
  - 3. Mason Industries, Inc.
  - 4. TOLCO; a brand of NIBCO INC.
- B. Hanger-Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod.
- C. Hinged and Swivel Brace Attachments: Multifunctional steel connectors for attaching hangers to rigid channel bracings.
- D. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings and matched to type and size of anchor bolts and studs.
- E. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings and matched to type and size of attachment devices used.
- F. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

## 2.5 MECHANICAL ANCHOR BOLTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. B-line, an Eaton business.
  - 2. Hilti, Inc.
  - 3. Kinetics Noise Control, Inc.
  - 4. Mason Industries, Inc.

- B. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

## 2.6 ADHESIVE ANCHOR BOLTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Hilti, Inc.
  - 2. Kinetics Noise Control, Inc.
  - 3. Mason Industries, Inc.
- B. Adhesive Anchor Bolts: Drilled-in and capsule anchor system containing PVC or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and equipment to receive vibration isolation and seismic-control devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for reinforcement and cast-in-place anchors to verify actual locations before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 APPLICATIONS

- A. Multiple Raceways or Cables: Secure raceways and cables to trapeze member with clamps approved for application by an agency acceptable to authorities having jurisdiction.
- B. Hanger-Rod Stiffeners: Install hanger-rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods caused by seismic forces.
- C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

### 3.3 SEISMIC-RESTRAINT DEVICE INSTALLATION

- A. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 033000 "Cast-in-Place Concrete." or Section 033160 "Miscellaneous Concrete Work."

## B. Equipment and Hanger Restraints:

1. Install resilient, bolt-isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch (3.2 mm).
2. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction providing required submittals for component.

## C. Install cables so they do not bend across edges of adjacent equipment or building structure.

## D. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

## E. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

## F. Drilled-in Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
5. Set anchors to manufacturer's recommended torque using a torque wrench.
6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

## 3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

- A. Install flexible connections in runs of raceways, cables and wireways where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where connection is terminated to equipment that is anchored to a different structural element from the one supporting them as they approach equipment.

## 3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

## B. Perform the following tests and inspections:

1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless post connection testing has been approved), and with at least seven days' advance notice.
3. Obtain Structural Engineer's approval before transmitting test loads to structure. Provide temporary load-spreading members.

4. Test at least four of each type and size of installed anchors and fasteners selected by Structural Engineer.
  5. Test to 90 percent of rated proof load of device.
- C. Seismic controls will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

### 3.6 ADJUSTING

- A. Adjust restraints to permit free movement of equipment within normal mode of operation.

END OF SECTION 260548.16



CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 260548.16 – SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the seismic controls for electrical systems are installed and are in general conformance with the Contract Documents, applicable Codes, and shop drawings. The seismic controls for electrical systems have been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_



## SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Identification for raceways.
  - 2. Identification of power and control cables.
  - 3. Identification for conductors.
  - 4. Underground-line warning tape.
  - 5. Warning labels and signs.
  - 6. Instruction signs.
  - 7. Equipment identification labels, including arc-flash warning labels.
  - 8. Miscellaneous identification products.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for electrical identification products.
- B. Identification Schedule: For each piece of electrical equipment and electrical system components to be an index of nomenclature for electrical equipment and system components used in identification signs and labels. Use same designations indicated on Drawings.
- C. Delegated-Design Submittal: For arc-flash hazard study.

## PART 2 - PRODUCTS

## 2.1 PERFORMANCE REQUIREMENTS

- A. Comply with ASME A13.1.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.
- E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

- F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
  - 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

## 2.2 COLOR AND LEGEND REQUIREMENTS

- A. Raceways and Cables Carrying Circuits at 600 V or Less:
  - 1. Black letters on an orange field.
  - 2. Legend: Indicate voltage.
- B. Raceways and Cables Carrying Circuits at More Than 600 V:
  - 1. Black letters on an orange field.
  - 2. Legend: "DANGER - CONCEALED HIGH VOLTAGE WIRING."
- C. Warning labels and signs shall include, but are not limited to, the following legends:
  - 1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
  - 2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 MM)."

## 2.3 LABELS

- A. Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible labels laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Brady Corporation.
    - b. Panduit Corp.
    - c. Seton Identification Products.
    - d. Thomas & Betts.
- B. Self-Adhesive Labels:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Brady Corporation.
    - b. Panduit Corp.
    - c. Seton Identification Products.
    - d. Thomas & Betts.
  - 2. Preprinted, 3-mil- (0.08-mm-) thick, vinyl flexible label with acrylic pressure-sensitive adhesive.
    - a. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating, protective shield over the legend. Labels sized to fit the cable diameter, such that the clear shield overlaps the entire printed legend.
  - 3. Vinyl, thermal, transfer-printed, 3-mil- (0.08-mm-) thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.
    - a. Nominal Size: 3.5-by-5-inch (76-by-127-mm).
  - 4. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
  - 5. Marker for Tags: Machine-printed, permanent, waterproof, black ink recommended by printer manufacturer.

## 2.4 TAPES AND STENCILS:

- A. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Carlton Industries, LP.
    - b. Champion America.
    - c. Ideal Industries, Inc.
    - d. Marking Services, Inc.
    - e. Panduit Corp.
- B. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide; compounded for outdoor use.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Brady Corporation.
    - b. Carlton Industries, LP.
    - c. Emedco.
    - d. Marking Services, Inc.
- C. Tape and Stencil for Raceways Carrying Circuits 600 V or Less: 4-inch- (100-mm-) wide black stripes on 10-inch (250-mm) centers placed diagonally over orange background that extends full length of raceway or duct and is 12 inches (300 mm) wide. Stop stripes at legends.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. LEM Products Inc.
    - b. Marking Services, Inc.
    - c. Seton Identification Products.
- D. Floor Marking Tape: 2-inch- (50-mm-) wide, 5-mil (0.125-mm) pressure-sensitive vinyl tape, with black and white stripes and clear vinyl overlay.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Carlton Industries, LP.
    - b. Seton Identification Products.
- E. Underground-Line Warning Tape
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Brady Corporation.
    - b. Ideal Industries, Inc.
    - c. LEM Products Inc.
    - d. Marking Services, Inc.
    - e. Reef Industries, Inc.
    - f. Seton Identification Products.
  - 2. Tape:
    - a. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
    - b. Printing on tape shall be permanent and shall not be damaged by burial operations.
    - c. Tape material and ink shall be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.

3. Color and Printing:
    - a. Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, ANSI Z535.4, and ANSI Z535.5.
    - b. Inscriptions for Red-Colored Tapes: "ELECTRIC LINE, HIGH VOLTAGE".
    - c. Inscriptions for Orange-Colored Tapes: "TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE".
  4. Tag: Type I:
    - a. Pigmented polyolefin, bright colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
    - b. Width: 3 inches (75 mm).
    - c. Thickness: 4 mils (0.1 mm).
    - d. Weight: 18.5 lb/1000 sq. ft. (9.0 kg/100 sq. m).
    - e. Tensile according to ASTM D 882: 30 lbf (133.4 N) and 2500 psi (17.2 MPa).
  5. Tag: Type II:
    - a. Multilayer laminate, consisting of high-density polyethylene scrim coated with pigmented polyolefin; bright colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
    - b. Width: 3 inches (75-mm).
    - c. Thickness: 12 mils (0.3 mm).
    - d. Weight: 36.1 lb/1000 sq. ft. (17.6 kg/100 sq. m).
    - e. Tensile according to ASTM D 882: 400 lbf (1780 N) and 11,500 psi (79.2 MPa).
  6. Tag: Type ID:
    - a. Detectable three-layer laminate, consisting of a printed pigmented polyolefin film, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core; bright colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
    - b. Width: 3 inches (75 mm).
    - c. Overall Thickness: 5 mils (0.125 mm).
    - d. Foil Core Thickness: 0.35 mil (0.00889 mm).
    - e. Weight: 28 lb/1000 sq. ft. (13.7 kg/100 sq. m).
    - f. Tensile according to ASTM D 882: 70 lbf (311.3 N) and 4600 psi (31.7 MPa).
  7. Tag: Type IID:
    - a. Reinforced, detectable three-layer laminate, consisting of a printed pigmented woven scrim, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core; bright-colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
    - b. Width: 3 inches (75-mm).
    - c. Overall Thickness: 8 mils (0.2 mm).
    - d. Foil Core Thickness: 0.35 mil (0.00889 mm).
    - e. Weight: 34 lb/1000 sq. ft. (16.6 kg/100 sq. m).
    - f. Tensile according to ASTM D 882: 300 lbf (1334 N) and 12,500 psi (86.1 MPa).
- F. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch (25 mm).
- G. Write-On Tags:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Carlton Industries, LP.
    - b. LEM Products Inc.
    - c. Seton Identification Products.
  2. Polyester Tags: 0.010 inch (0.25 mm) thick, with corrosion-resistant grommet and cable tie for attachment to raceway, conductor, or cable.
  3. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

4. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

## 2.5 Signs

### A. Baked-Enamel Signs:

1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
2. 1/4-inch (6.4-mm) grommets in corners for mounting.
3. Nominal Size: 7 by 10 inches (180 by 250 mm).
4. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Carlton Industries, LP.
  - b. Champion America.
  - c. emedco.
  - d. Marking Services, Inc.

### B. Metal-Backed Butyrate Signs:

1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs, with 0.0396-inch (1-mm) galvanized-steel backing and with colors, legend, and size required for application.
2. 1/4-inch (6.4-mm) grommets in corners for mounting.
3. Nominal Size: 10 by 14 inches (250 by 360 mm).
4. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Brady Corporation.
  - b. Champion America.
  - c. emedco.
  - d. Marking Services, Inc.

### C. Laminated Acrylic or Melamine Plastic Signs:

1. Engraved legend.
2. Thickness:
  - a. For signs up to 20 sq. inches (129 sq. cm), minimum 1/16-inch- (1.6-mm-).
  - b. For signs larger than 20 sq. inches (129 sq. cm), 1/8 inch (3.2 mm) thick.
  - c. Engraved legend with black letters on white face.
  - d. Punched or drilled for mechanical fasteners.
  - e. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.
3. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Brady Corporation.
  - b. Carlton Industries, LP.
  - c. emedco.
  - d. Marking Services, Inc.

## 2.6 CABLE TIES

- ### A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Ideal Industries, Inc.
  2. Marking Services, Inc.
  3. Panduit Corp.

- B. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, Type 6/6 nylon.
  - 1. Minimum Width: 3/16 inch (5 mm).
  - 2. Tensile Strength at 73 deg F (23 deg C) according to ASTM D 638: 12,000 psi (82.7 MPa).
  - 3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
  - 4. Color: Black, except where used for color-coding.
- C. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, Type 6/6 nylon.
  - 1. Minimum Width: 3/16 inch (5 mm).
  - 2. Tensile Strength at 73 deg F (23 deg C) according to ASTM D 638: 12,000 psi (82.7 MPa).
  - 3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
  - 4. Color: Black.
- D. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, self-locking.
  - 1. Minimum Width: 3/16 inch (5 mm).
  - 2. Tensile Strength at 73 deg F (23 deg C) according to ASTM D 638: 7000 psi (48.2 MPa).
  - 3. UL 94 Flame Rating: 94V-0.
  - 4. Temperature Range: Minus 50 to plus 284 deg F (Minus 46 to plus 140 deg C).
  - 5. Color: Black.

## 2.7 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).
- B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

### 3.2 INSTALLATION

- A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.
- B. Install identifying devices before installing acoustical ceilings and similar concealment.
- C. Verify identity of each item before installing identification products.



- D. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.
- E. Apply identification devices to surfaces that require finish after completing finish work.
- F. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
- G. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:
  - 1. Outdoors: UV-stabilized nylon.
  - 2. In Spaces Handling Environmental Air: Plenum rated.
- H. Painted Identification: Comply with requirements in painting Sections for surface preparation and paint application.
- I. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.
- J. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 8 inches (150 to 200 mm) below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches (400 mm) overall.

### 3.3 IDENTIFICATION SCHEDULE

- A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits, More Than 30 and 120 V to Ground: Identify with self-adhesive vinyl label. Install labels at 10-foot (3-m) maximum intervals.
- B. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
  - 1. Color-Coding for Phase Identification, 600 V or Less: Use colors listed below for ungrounded service, feeder and branch-circuit conductors.
    - a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG if authorities having jurisdiction permit.
    - b. Colors for 208/120-V Circuits:
      - 1) Phase A: Black.
      - 2) Phase B: Red.
      - 3) Phase C: Blue.
    - c. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
- C. Install instructional sign, including the color code for grounded and ungrounded conductors using adhesive-film-type labels.
- D. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive vinyl labels with the conductor or cable designation, origin, and destination.
- E. Control-Circuit Conductor Termination Identification: For identification at terminations, provide self-adhesive vinyl labels with the conductor designation.

- F. Conductors To Be Extended in the Future: Attach write-on tags to conductors and list source.
- G. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
  - 1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
  - 2. Use system of marker-tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
  - 3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.
- H. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical-fiber cable.
  - 1. Limit use of underground-line warning tape to direct-buried cables.
  - 2. Install underground-line warning tape for direct-buried cables and cables in raceways.
- I. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall comply with NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.
- J. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels.
  - 1. Comply with 29 CFR 1910.145.
  - 2. Identify system voltage with black letters on an orange background.
  - 3. Apply to exterior of door, cover, or other access.
- K. Arc Flash Warning Labeling: Self-adhesive thermal transfer vinyl labels.
  - 1. Comply with NFPA 70E and ANSI Z535.4.
- L. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
- M. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm unless equipment is provided with its own identification.
  - 1. Labeling Instructions:
    - a. Indoor Equipment: Self-adhesive label. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high.
    - b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
    - c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
    - d. Unless labels are provided with self-adhesive means of attachment, fasten them with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.
  - 2. Equipment To Be Labeled:
    - a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be in the form of a self-adhesive, engraved, laminated acrylic or melamine label.
    - b. Enclosures and electrical cabinets.
    - c. Access doors and panels for concealed electrical items.

- d. Switchgear.
- e. Switchboards.
- f. Transformers: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
- g. Emergency system boxes and enclosures.
- h. Enclosed switches.
- i. Enclosed circuit breakers.
- j. Enclosed controllers.
- k. Variable-speed controllers.
- l. Push-button stations.
- m. Contactors.
- n. Remote-controlled switches, dimmer modules, and control devices.

END OF SECTION 260553

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 260553 – IDENTIFICATION FOR ELECTRICAL SYSTEMS

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the identification for electrical systems is installed and is in general conformance with the Contract Documents, applicable Codes, and shop drawings. The identification for electrical systems has been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

IDENTIFICATION FOR ELECTRICAL SYSTEMS INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_

## SECTION 260923 - LIGHTING CONTROL DEVICES

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Time switches.
  - 2. Photoelectric switches.
  - 3. Indoor occupancy sensors.
  - 4. Lighting contactors.
- B. Related Requirements:
  - 1. Section 262726 "Wiring Devices" for wall-box dimmers, wall-switch occupancy sensors, and manual light switches.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show installation details for occupancy and light-level sensors.

## 1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

## 1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For each type of lighting control device to include in emergency, operation, and maintenance manuals.

## PART 2 - PRODUCTS

## 2.1 TIME SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Cooper Industries, Inc.
  - 2. Intermatic, Inc.
  - 3. Invensys Controls.
  - 4. Leviton Manufacturing Co., Inc.

5. NSi Industries LLC.
  6. Tyco Electronics Corporation; a TE Connectivity Ltd. company.
- B. Electronic Time Switches: Solid state, programmable, with alphanumeric display; complying with UL 917.
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
  2. Contact Configuration: SPST.
  3. Contact Rating: 30-A inductive or resistive, 240-V ac.
  4. Circuitry: Allow connection of a photoelectric relay as substitute for on-off function of a program on selected channels].
  5. Astronomic Time: Selected channels.
  6. Automatic daylight savings time changeover.
  7. Battery Backup: Not less than seven days reserve, to maintain schedules and time clock.

## 2.2 OUTDOOR PHOTOELECTRIC SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Cooper Industries, Inc.
  2. Intermatic, Inc.
  3. Leviton Manufacturing Co., Inc.
  4. NSi Industries LLC.
  5. Tyco Electronics Corporation; a TE Connectivity Ltd. company.
- B. Description: Solid state, with SPST dry contacts rated for 1800 VA, to operate connected load, complying with UL 773.
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
  2. Light-Level Monitoring Range: 1.5 to 10 fc (16.14 to 108 lux), with an adjustment for turn-on and turn-off levels within that range.
  3. Time Delay: Thirty-second minimum, to prevent false operation.
  4. Lightning Arrester: Air-gap type.
  5. Mounting: Twist lock complying with NEMA C136.10, with base.

## 2.3 INDOOR OCCUPANCY SENSORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Bryant Electric.
  2. Cooper Industries, Inc.
  3. Hubbell Building Automation, Inc.
  4. Leviton Manufacturing Co., Inc.
  5. Lithonia Lighting; Acuity Brands Lighting, Inc.
  6. Lutron Electronics Co., Inc.
  7. NSi Industries LLC.
  8. Philips Lighting Controls.
  9. RAB Lighting.
  10. Sensor Switch, Inc.
  11. Square D.
  12. Watt Stopper.

- B. General Requirements for Sensors: Wall- or ceiling-mounted, solid-state indoor occupancy sensors with a separate power pack.
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
  2. Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
  3. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor is powered from the power pack.
  4. Power Pack: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.
  5. Mounting:
    - a. Sensor: Suitable for mounting in any position on a standard outlet box.
    - b. Relay: Externally mounted through a 1/2-inch (13-mm) knockout in a standard electrical enclosure.
    - c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
  6. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
  7. Bypass Switch: Override the "on" function in case of sensor failure.
- C. PIR Type: Ceiling mounted; detect occupants in coverage area by their heat and movement.
1. Detector Sensitivity: Detect occurrences of 6-inch- (150-mm-) minimum movement of any portion of a human body that presents a target of not less than 36 sq. in. (232 sq. cm).
  2. Detection Coverage (Room): Detect occupancy anywhere in a circular area of 1000 sq. ft. (93 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.
  3. Detection Coverage (Corridor): Detect occupancy within 90 feet (27.4 m) when mounted on a 10-foot- (3-m-) high ceiling.
- D. Ultrasonic Type: Ceiling mounted; detect occupants in coverage area through pattern changes of reflected ultrasonic energy .
1. Detector Sensitivity: Detect a person of average size and weight moving not less than 12 inches (305 mm) in either a horizontal or a vertical manner at an approximate speed of 12 inches/s (305 mm/s).
  2. Detection Coverage (Small Room): Detect occupancy anywhere within a circular area of 600 sq. ft. (56 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.
  3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. (93 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.
  4. Detection Coverage (Large Room): Detect occupancy anywhere within a circular area of 2000 sq. ft. (186 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.
  5. Detection Coverage (Corridor): Detect occupancy anywhere within 90 feet (27.4 m) when mounted on a 10-foot- (3-m-) high ceiling in a corridor not wider than 14 feet (4.3 m).
- E. Dual-Technology Type: Ceiling mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.
1. Sensitivity Adjustment: Separate for each sensing technology.
  2. Detector Sensitivity: Detect occurrences of 6-inch- (150-mm-) minimum movement of any portion of a human body that presents a target of not less than 36 sq. in. (232 sq. cm), and detect a person of average size and weight moving not less than 12 inches (305 mm) in either a horizontal or a vertical manner at an approximate speed of 12 inches/s (305 mm/s).
  3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. (93 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.

## 2.4 SWITCHBOX-MOUNTED OCCUPANCY SENSORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Bryant Electric.
  - 2. Cooper Industries, Inc.
  - 3. Hubbell Building Automation, Inc.
  - 4. Leviton Manufacturing Co., Inc.
  - 5. Lithonia Lighting; Acuity Brands Lighting, Inc.
  - 6. Lutron Electronics Co., Inc.
  - 7. NSi Industries LLC.
  - 8. Philips Lighting Controls.
  - 9. RAB Lighting.
  - 10. Sensor Switch, Inc.
  - 11. Square D.
  - 12. Watt Stopper.
- B. General Requirements for Sensors: Automatic-wall-switch occupancy sensor, suitable for mounting in a single gang switchbox.
  - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
  - 2. Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F (0 to 49 deg C).
  - 3. Switch Rating: Not less than 800-VA fluorescent at 120 V, 1200-VA fluorescent at 277 V, and 800-W incandescent.

## 2.5 LIGHTING CONTACTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Allen-Bradley/Rockwell Automation.
  - 2. ASCO Power Technologies, LP; a business of Emerson Network Power.
  - 3. Eaton Corporation.
  - 4. General Electric Company.
  - 5. Square D.
- B. Description: Electrically operated and electrically held, combination-type lighting contactors with nonfused disconnect, complying with NEMA ICS 2 and UL 508.
  - 1. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballast with 15 percent or less total harmonic distortion of normal load current).
  - 2. Fault Current Withstand Rating: Equal to or exceeding the available fault current at the point of installation.
  - 3. Enclosure: Comply with NEMA 250.
  - 4. Provide with control and pilot devices as indicated on Drawings, matching the NEMA type specified for the enclosure.

## 2.6 CONDUCTORS AND CABLES

- A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."



- B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 14 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

## PART 3 - EXECUTION

### 3.1 SENSOR INSTALLATION

- A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.
- B. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

### 3.2 CONTACTOR INSTALLATION

- A. Mount electrically held lighting contactors with elastomeric isolator pads to eliminate structure-borne vibration, unless contactors are installed in an enclosure with factory-installed vibration isolators.

### 3.3 WIRING INSTALLATION

- A. Wiring Method: Comply with Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 1/2 inch (13 mm).
- B. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.
- C. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.
- D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

### 3.4 IDENTIFICATION

- A. Identify components and power and control wiring according to Section 260553 "Identification for Electrical Systems."
  - 1. Identify controlled circuits in lighting contactors.
  - 2. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.
- B. Label time switches and contactors with a unique designation.

### 3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to evaluate lighting control devices and perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Lighting control devices will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

### 3.6 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting sensors to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.
  - 1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.
  - 2. For daylighting controls, adjust set points and deadband controls to suit Owner's operations.
  - 3. Align high-bay occupancy sensors using manufacturer's laser aiming tool.

END OF SECTION 260923

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 260923 – LIGHTING CONTROL DEVICES

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the lighting control devices are installed and are in general conformance with the Contract Documents, applicable Codes, and shop drawings. The lighting control devices have been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

LIGHTING CONTROL DEVICE INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_



## SECTION 262413 - SWITCHBOARDS

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Service and distribution switchboards rated 600 V and less.
  - 2. Disconnecting and overcurrent protective devices.
  - 3. Instrumentation.
  - 4. Accessory components and features.
  - 5. Identification.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each switchboard, overcurrent protective device, surge protection device, ground-fault protector, accessory, and component.
  - 1. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
- B. Shop Drawings: For each switchboard and related equipment.
  - 1. Include dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings.
  - 2. Detail enclosure types for types other than NEMA 250, Type 1.
  - 3. Detail bus configuration, current, and voltage ratings.
  - 4. Detail short-circuit current rating of switchboards and overcurrent protective devices.
  - 5. Detail utility company's metering provisions with indication of approval by utility company.
  - 6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

## 1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Seismic Qualification Certificates: For switchboards, overcurrent protective devices, accessories, and components, from manufacturer.
  - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
  - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
  - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

- C. Field Quality-Control Reports:
  - 1. Test procedures used.
  - 2. Test results that comply with requirements.
  - 3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For switchboards and components to include in emergency, operation, and maintenance manuals.
  - 1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
    - a. Routine maintenance requirements for switchboards and all installed components.
    - b. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
    - c. Time-current coordination curves for each type and rating of overcurrent protective device included in switchboards. Submit on translucent log-log graph paper; include selectable ranges for each type of overcurrent protective device.

#### 1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Potential Transformer Fuses: Equal to 10 percent of quantity installed for each size and type but no fewer than two of each size and type.
  - 2. Fuses and Fusible Devices for Fused Circuit Breakers: Equal to 10 percent of quantity installed for each size and type but no fewer than three of each size and type.
  - 3. Fuses for Fused Switches: Equal to 10 percent of quantity installed for each size and type but no fewer than three of each size and type.
  - 4. Fuses for Fused Power-Circuit Devices: Equal to 10 percent of quantity installed for each size and type but no fewer than three of each size and type.
  - 5. Indicating Lights: Equal to 10 percent of quantity installed for each size and type but no less than one of each size and type.

#### 1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers qualified as defined in NEMA PB 2.1 and trained in electrical safety as required by NFPA 70E.
- B. Testing Agency Qualifications: Member company of NETA or an NRTL.
  - 1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

#### 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver switchboards in sections or lengths that can be moved past obstructions in delivery path.
- B. Remove loose packing and flammable materials from inside switchboards and install temporary electric heating (250 W per section) to prevent condensation.
- C. Handle and prepare switchboards for installation according to NECA 400.

## 1.9 FIELD CONDITIONS

- A. Installation Pathway: Remove and replace access fencing, doors, lift-out panels, and structures to provide pathway for moving switchboards into place.
- B. Environmental Limitations:
  - 1. Do not deliver or install switchboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above switchboards is complete, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
  - 2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
    - a. Ambient Temperature: Not exceeding 104 deg F (40 deg C).
    - b. Altitude: Not exceeding 6600 feet (2000 m).
- C. Unusual Service Conditions: NEMA PB 2, as follows:
  - 1. Ambient temperatures within limits specified.
  - 2. Altitude not exceeding 6600 feet (2000 m).

## 1.10 COORDINATION

- A. Coordinate layout and installation of switchboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

## 1.11 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace switchboard enclosures, buswork, overcurrent protective devices, accessories, and factory installed interconnection wiring that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: Three years from date of Substantial Completion.
- B. Manufacturer's Warranty: Manufacturer's agrees to repair or replace surge protection devices that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: Five years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Switchboards shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
  - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation. Shake-table testing shall comply with ICC-ES AC156.

2. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

## 2.2 SWITCHBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Eaton.
  2. General Electric Company.
  3. Siemens Power Transmission & Distribution, Inc.
  4. Square D; by Schneider Electric.
- B. Source Limitations: Obtain switchboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.
- C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for switchboards including clearances between switchboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- D. 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.
- E. Comply with NEMA PB 2.
- F. Comply with NFPA 70.
- G. Comply with UL 891.
- H. Front-Connected, Front-Accessible Switchboards:
  1. Main Devices: Panel mounted.
  2. Branch Devices: Panel mounted.
  3. Sections front and rear aligned.
- I. Front- and Side-Accessible Switchboards:
  1. Main Devices: Fixed, individually mounted.
  2. Branch Devices: Panel mounted.
  3. Section Alignment: Front and Rear aligned.
- J. Front- and Rear-Accessible Switchboards:
  1. Main Devices: Fixed, individually mounted.
  2. Branch Devices: Panel mounted.
  3. Sections front and rear aligned.
- K. Nominal System Voltage: 208Y/120 V.
- L. Main-Bus Continuous: 400 A.
- M. Seismic Requirements: Fabricate and test switchboards according to IEEE 344 to withstand seismic forces defined in Section 260548.16 "Seismic Controls for Electrical Systems."
  1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation. Shake-table testing shall comply with ICC-ES AC156.
    - a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."



- b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
- N. Indoor Enclosures: Steel, NEMA 250, Type 1.
- O. Enclosure Finish for Indoor Units: Factory-applied finish in manufacturer's standard gray finish over a rust-inhibiting primer on treated metal surface.
- P. Outdoor Enclosures: Type 3R.
  - 1. Finish: Factory-applied finish in manufacturer's [standard] [custom] color; undersurfaces treated with corrosion-resistant undercoating.
  - 2. Enclosure: Flat roof; bolt-on rear covers for each section, with provisions for padlocking.
  - 3. Doors: Personnel door at each end of aisle, minimum width of 30 inches (762 mm); opening outwards; with panic hardware and provisions for padlocking. At least one door shall be sized to permit the largest single switchboard section to pass through without disassembling doors, hinges, or switchboard section.
  - 4. Power for Space Heaters, Ventilation, Lighting, and Receptacle: Include a control-power transformer, with spare capacity of 25 percent, within the switchboard. Supply voltage shall be 120 V ac.
  - 5. Power for space heaters, ventilation, lighting, and receptacle provided by a remote source.
- Q. Barriers: Between adjacent switchboard sections.
- R. Insulation and isolation for main bus of main section and main and vertical buses of feeder sections.
- S. Space Heaters: Factory-installed electric space heaters of sufficient wattage in each vertical section to maintain enclosure temperature above expected dew point.
  - 1. Space-Heater Control: Thermostats to maintain temperature of each section above expected dew point.
  - 2. Space-Heater Power Source: Transformer, factory installed in switchboard.
- T. Service Entrance Rating: Switchboards intended for use as service entrance equipment shall contain from one to six service disconnecting means with overcurrent protection, a neutral bus with disconnecting link, a grounding electrode conductor terminal, and a main bonding jumper.
- U. Utility Metering Compartment: Barrier compartment and section complying with utility company's requirements; hinged sealable door; buses provisioned for mounting utility company's current transformers and potential transformers or potential taps as required by utility company. If separate vertical section is required for utility metering, match and align with basic switchboard. Provide service entrance label and necessary applicable service entrance features.
- V. Bus Transition and Incoming Pull Sections: Matched and aligned with basic switchboard.
- W. Removable, Hinged Rear Doors and Compartment Covers: Secured by captive thumb screws, for access to rear interior of switchboard.
- X. Hinged Front Panels: Allow access to circuit breaker, metering, accessory, and blank compartments.
- Y. Buses and Connections: Three phase, four wire unless otherwise indicated.
  - 1. Provide phase bus arrangement A, B, C from front to back, top to bottom, and left to right when viewed from the front of the switchboard.

2. Phase- and Neutral-Bus Material: Hard-drawn copper of 98 percent conductivity,.
3. Copper feeder circuit-breaker line connections.
4. Ground Bus: Minimum-size required by UL 891, hard-drawn copper of 98 percent conductivity, equipped with mechanical connectors for feeder and branch-circuit ground conductors.
5. Main-Phase Buses and Equipment-Ground Buses: Uniform capacity for entire length of switchboard's main and distribution sections. Provide for future extensions from both ends.
6. Disconnect Links:
  - a. Isolate neutral bus from incoming neutral conductors.
  - b. Bond neutral bus to equipment-ground bus for switchboards utilized as service equipment or separately derived systems.
7. Neutral Buses: 50 percent of the ampacity of phase buses unless otherwise indicated, equipped with [mechanical] [compression] connectors for outgoing circuit neutral cables. Brace bus extensions for busway feeder neutral bus.
8. Neutral Buses: 100 percent of the ampacity of phase buses unless otherwise indicated, equipped with [mechanical] [compression] connectors for outgoing circuit neutral cables. Brace bus extensions for busway feeder neutral bus.

## 2.3 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.
  1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
  2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
  3. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:
    - a. Instantaneous trip.
    - b. Long- and short-time pickup levels.
    - c. Long and short time adjustments.
  4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
  5. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker; trip activation on fuse opening or on opening of fuse compartment door.
  6. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6-mA trip).
  7. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
  8. MCCB Features and Accessories:
    - a. Standard frame sizes, trip ratings, and number of poles.
    - b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor material.
    - c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.

## 2.4 IDENTIFICATION

- A. Service Equipment Label: NRTL labeled for use as service equipment for switchboards with one or more service disconnecting and overcurrent protective devices.

## PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Receive, inspect, handle, and store switchboards according to NECA 400.
  - 1. Lift or move panelboards with spreader bars and manufacturer-supplied lifting straps following manufacturer's instructions.
  - 2. Use rollers, slings, or other manufacturer-approved methods if lifting straps are not furnished.
  - 3. Protect from moisture, dust, dirt, and debris during storage and installation.
  - 4. Install temporary heating during storage per manufacturer's instructions.
- B. Examine switchboards before installation. Reject switchboards that are moisture damaged or physically damaged.
- C. Examine elements and surfaces to receive switchboards for compliance with installation tolerances and other conditions affecting performance of the Work or that affect the performance of the equipment.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 INSTALLATION

- A. Install switchboards and accessories according to NECA 400.
- B. Equipment Mounting: Install switchboards on concrete base, 4-inch (100-mm) nominal thickness. Comply with requirements for concrete base specified in Section 033000 "Cast-in-Place Concrete." or Section 033160 "Miscellaneous Concrete Work."
  - 1. Install conduits entering underneath the switchboard, entering under the vertical section where the conductors will terminate. Install with couplings flush with the concrete base. Extend 2 inches (50-mm) above concrete base after switchboard is anchored in place.
  - 2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of concrete base.
  - 3. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
  - 4. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 5. Install anchor bolts to elevations required for proper attachment to switchboards.
  - 6. Anchor switchboard to building structure at the top of the switchboard if required or recommended by the manufacturer.
- C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, straps and brackets, and temporary blocking of moving parts from switchboard units and components.
- D. Comply with mounting and anchoring requirements specified in Section 260548.16 "Seismic Controls for Electrical Systems."
- E. Operating Instructions: Frame and mount the printed basic operating instructions for switchboards, including control and key interlocking sequences and emergency procedures. Fabricate frame of finished wood or metal and cover instructions with clear acrylic plastic. Mount on front of switchboards.

- F. Install filler plates in unused spaces of panel-mounted sections.
- G. Install overcurrent protective devices, surge protection devices, and instrumentation.
  - 1. Set field-adjustable switches and circuit-breaker trip ranges.
- H. Comply with NECA 1.

### 3.3 CONNECTIONS

- A. Bond conduits entering underneath the switchboard to the equipment ground bus with a bonding conductor sized per NFPA 70.
- B. Support and secure conductors within the switchboard according to NFPA 70.
- C. Extend insulated equipment grounding cable to busway ground connection and support cable at intervals in vertical run.

### 3.4 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- B. Switchboard Nameplates: Label each switchboard compartment with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- C. Device Nameplates: Label each disconnecting and overcurrent protective device and each meter and control device mounted in compartment doors with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

### 3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- C. Perform the following tests and inspections:
  - 1. Acceptance Testing:
    - a. Test insulation resistance for each switchboard bus, component, connecting supply, feeder, and control circuit. Open control and metering circuits within the switchboard, and remove neutral connection to surge protection and other electronic devices prior to insulation test. Reconnect after test.
    - b. Test continuity of each circuit.
  - 2. Test ground-fault protection of equipment for service equipment per NFPA 70.
  - 3. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
  - 4. Correct malfunctioning units on-site where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
  - 5. Perform the following infrared scan tests and inspections, and prepare reports:

- a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each switchboard. Remove front panels so joints and connections are accessible to portable scanner.
  - b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switchboard 11 months after date of Substantial Completion.
  - c. Instruments and Equipment:
    - 1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
6. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Switchboard will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports, including a certified report that identifies switchboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

### 3.6 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.
- B. Set field-adjustable circuit-breaker trip ranges as indicated.

### 3.7 PROTECTION

- A. Temporary Heating: Apply temporary heat, to maintain temperature according to manufacturer's written instructions, until switchboard is ready to be energized and placed into service.

### 3.8 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain switchboards, overcurrent protective devices, instrumentation, and accessories.

END OF SECTION 262413

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 262413 – SWITCHBOARDS

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the switchboards are installed and are in general conformance with the Contract Documents, applicable Codes, and shop drawings. The switchboards have been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

SWITCHBOARD INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_

## SECTION 262416 - PANELBOARDS

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Distribution panelboards.
  - 2. Lighting and appliance branch-circuit panelboards.
  - 3. Load centers.

## 1.3 DEFINITIONS

- A. ATS: Acceptance testing specification.
- B. GFCI: Ground-fault circuit interrupter.
- C. GFEP: Ground-fault equipment protection.
- D. HID: High-intensity discharge.
- E. MCCB: Molded-case circuit breaker.
- F. VPR: Voltage protection rating.

## 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of panelboard.
  - 1. Include materials, switching and overcurrent protective devices, SPDs, accessories, and components indicated.
  - 2. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For each panelboard and related equipment.
  - 1. Include dimensioned plans, elevations, sections, and details.
  - 2. Show tabulations of installed devices with nameplates, conductor termination sizes, equipment features, and ratings.
  - 3. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
  - 4. Detail bus configuration, current, and voltage ratings.
  - 5. Short-circuit current rating of panelboards and overcurrent protective devices.
  - 6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
  - 7. Include wiring diagrams for power, signal, and control wiring.

## PANELBOARDS

8. Key interlock scheme drawing and sequence of operations.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Panelboard Schedules: For installation in panelboards.

#### 1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
  1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
  2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

#### 1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  1. Keys: Two spares for each type of panelboard cabinet lock.
  2. Circuit Breakers Including GFCI and GFEP Types: Two spares for each panelboard.

#### 1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: ISO 9001 or 9002 certified.

#### 1.9 DELIVERY, STORAGE, AND HANDLING

- A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.
- B. Handle and prepare panelboards for installation according to NECA 407.

#### 1.10 FIELD CONDITIONS

- A. Environmental Limitations:
  1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
  2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
    - a. Altitude: Not exceeding 6600 feet (2000 m).
- B. Service Conditions: NEMA PB 1, usual service conditions, as follows:
  1. Ambient temperatures within limits specified.



2. Altitude not exceeding 6600 feet (2000 m).

C. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Construction Manager no fewer than two days in advance of proposed interruption of electric service.
2. Do not proceed with interruption of electric service without Construction Manager's written permission.
3. Comply with NFPA 70E.

#### 1.11 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.

1. Panelboard Warranty Period: 18 months from date of Substantial Completion.

### PART 2 - PRODUCTS

#### 2.1 PANELBOARDS AND LOAD CENTERS COMMON REQUIREMENTS

A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Section 260548.16 "Seismic Controls for Electrical Systems."

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NEMA PB 1.

E. Comply with NFPA 70.

F. Enclosures: Surface-mounted, dead-front cabinets.

1. Rated for environmental conditions at installed location.
  - a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
  - b. Outdoor Locations: NEMA 250, Type 3R.
  - c. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
2. Height: 84 inches (2.13 m) maximum.
3. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box. Trims shall cover all live parts and shall have no exposed hardware.
4. Finishes:
  - a. Panels and Trim: Steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
  - b. Back Boxes: Same finish as panels and trim.

G. Incoming Mains:

1. Location: Top.

### PANELBOARDS

2. Main Breaker: Main lug interiors up to 400 amperes shall be field convertible to main breaker.
- H. Phase, Neutral, and Ground Buses:
1. Material: Tin-plated aluminum.
    - a. Plating shall run entire length of bus.
    - b. Bus shall be fully rated the entire length.
  2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
  3. Isolated Ground Bus: Adequate for branch-circuit isolated ground conductors; insulated from box.
  4. Full-Sized Neutral: Equipped with full-capacity bonding strap for service entrance applications. Mount electrically isolated from enclosure. Do not mount neutral bus in gutter.
- I. Conductor Connectors: Suitable for use with conductor material and sizes.
1. Material: Tin-plated aluminum.
  2. Terminations shall allow use of 75 deg C rated conductors without derating.
  3. Size: Lugs suitable for indicated conductor sizes, with additional gutter space, if required, for larger conductors.
  4. Main and Neutral Lugs: Compression type, with a lug on the neutral bar for each pole in the panelboard.
  5. Ground Lugs and Bus-Configured Terminators: Compression type, with a lug on the bar for each pole in the panelboard.
  6. Feed-Through Lugs: Compression type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
- J. NRTL Label: Panelboards or load centers shall be labeled by an NRTL acceptable to authority having jurisdiction for use as service equipment with one or more main service disconnecting and overcurrent protective devices. Panelboards or load centers shall have meter enclosures, wiring, connections, and other provisions for utility metering. Coordinate with utility company for exact requirements.
- K. Future Devices: Panelboards or load centers shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
1. Percentage of Future Space Capacity: Five percent.
- L. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity.
1. Panelboards and overcurrent protective devices rated 240 V or less shall have short-circuit ratings as shown on Drawings, but not less than 10,000 A rms symmetrical.
  2. Panelboards and overcurrent protective devices rated above 240 V and less than 600 V shall have short-circuit ratings as shown on Drawings, but not less than 14,000 A rms symmetrical.

## 2.2 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Panelboards shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

## 2.3 POWER PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Eaton.
  - 2. ESL Power Systems, Inc.
  - 3. General Electric Company; GE Energy Management - Electrical Distribution.
  - 4. Siemens Energy.
  - 5. Square D; by Schneider Electric.
- B. Panelboards: NEMA PB 1, distribution type.
- C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
  - 1. For doors more than 36 inches (914 mm) high, provide two latches, keyed alike.
- D. Mains: Circuit breaker.
- E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
- F. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers.
- G. Branch Overcurrent Protective Devices: Fused switches.

## 2.4 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Eaton.
  - 2. General Electric Company; GE Energy Management - Electrical Distribution.
  - 3. Siemens Energy.
  - 4. Square D; by Schneider Electric.
- B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
- C. Mains: Circuit breaker or lugs only.
- D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- E. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.
- F. Doors: Door-in-door construction with concealed hinges; secured with multipoint latch with tumbler lock; keyed alike. Outer door shall permit full access to the panel interior. Inner door shall permit access to breaker operating handles and labeling, but current carrying terminals and bus shall remain concealed.

## 2.5 LOAD CENTERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Eaton.

2. General Electric Company; GE Energy Management - Electrical Distribution.
  3. Siemens Energy.
  4. Square D; by Schneider Electric.
- B. Load Centers: Comply with UL 67.
- C. Mains: Circuit breaker or lugs only.
- D. Branch Overcurrent Protective Devices: Plug-in circuit breakers, replaceable without disturbing adjacent units.
- E. Doors: Concealed hinges secured with flush latch with tumbler lock; keyed alike.
- F. Conductor Connectors: Mechanical type for main, neutral, and ground lugs and buses.

## 2.6 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton.
  2. General Electric Company; GE Energy Management - Electrical Distribution.
  3. Siemens Energy.
  4. Square D; by Schneider Electric.
- B. MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.
1. Thermal-Magnetic Circuit Breakers:
    - a. Inverse time-current element for low-level overloads.
    - b. Instantaneous magnetic trip element for short circuits.
    - c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
  2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
  3. Electronic Trip Circuit Breakers:
    - a. RMS sensing.
    - b. Field-replaceable rating plug or electronic trip.
    - c. Digital display of settings, trip targets, and indicated metering displays.
    - d. Multi-button keypad to access programmable functions and monitored data.
    - e. Ten-event, trip-history log. Each trip event shall be recorded with type, phase, and magnitude of fault that caused the trip.
    - f. Integral test jack for connection to portable test set or laptop computer.
    - g. Field-Adjustable Settings:
      - 1) Instantaneous trip.
      - 2) Long- and short-time pickup levels.
      - 3) Long and short time adjustments.
  4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
  5. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6-mA trip).
  6. GFEP Circuit Breakers: Class B ground-fault protection (30-mA trip).
  7. Arc-Fault Circuit Interrupter Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
  8. Subfeed Circuit Breakers: Vertically mounted.
  9. MCCB Features and Accessories:
    - a. Standard frame sizes, trip ratings, and number of poles.
    - b. Breaker handle indicates tripped status.

- c. UL listed for reverse connection without restrictive line or load ratings.
- d. Lugs: Compression style, suitable for number, size, trip ratings, and conductor materials.
- e. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and HID lighting circuits.
- f. Ground-Fault Protection: [Integrally mounted] [Remote-mounted] relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
- g. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
- h. Rating Plugs: Three-pole breakers with ampere ratings greater than 150 amperes shall have interchangeable rating plugs or electronic adjustable trip units.
- i. Multipole units enclosed in a single housing with a single handle.
- j. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.

## 2.7 IDENTIFICATION

- A. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.
- B. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.
- C. Circuit Directory: Directory card inside panelboard door, mounted in transparent card holder.
  - 1. Circuit directory shall identify specific purpose with detail sufficient to distinguish it from all other circuits.
- D. Circuit Directory: Computer-generated circuit directory mounted inside panelboard door with transparent plastic protective cover.
  - 1. Circuit directory shall identify specific purpose with detail sufficient to distinguish it from all other circuits.

## 2.8 ACCESSORY COMPONENTS AND FEATURES

- A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Verify actual conditions with field measurements prior to ordering panelboards to verify that equipment fits in allocated space in, and comply with, minimum required clearances specified in NFPA 70.
- B. Receive, inspect, handle, and store panelboards according to NECA 407.
- C. Examine panelboards before installation. Reject panelboards that are damaged, rusted, or have been subjected to water saturation.

- D. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Comply with NECA 1.
- C. Install panelboards and accessories according to NECA 407.
- D. Equipment Mounting:
  - 1. Attach panelboard to the vertical finished or structural surface behind the panelboard.
  - 2. Comply with requirements for seismic control devices specified in Section 260548.16 "Seismic Controls for Electrical Systems."
- E. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.
- F. Comply with mounting and anchoring requirements specified in Section 260548.16 "Seismic Controls for Electrical Systems."
- G. Mount top of trim 90 inches (2286 mm) above finished floor unless otherwise indicated.
- H. Mount panelboard cabinet plumb and rigid without distortion of box.
- I. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
- J. Mounting panelboards with space behind is recommended for damp, wet, or dirty locations. The steel slotted supports in the following paragraph provide an even mounting surface and the recommended space behind to prevent moisture or dirt collection.
- K. Mount surface-mounted panelboards to steel slotted supports 5/8 inch (16 mm) in depth. Orient steel slotted supports vertically.
- L. Install overcurrent protective devices and controllers not already factory installed.
  - 1. Set field-adjustable, circuit-breaker trip ranges.
  - 2. Tighten bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer's written instructions.
- M. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.
- N. Install filler plates in unused spaces.

### 3.3 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems."
- B. Create a directory to indicate installed circuit loads after balancing panelboard loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.
- C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- D. Device Nameplates: Label each branch circuit device in power panelboards with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- E. Install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems" identifying source of remote circuit.

### 3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- B. Perform tests and inspections.
  - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- C. Acceptance Testing Preparation:
  - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
  - 2. Test continuity of each circuit.
- D. Tests and Inspections:
  - 1. Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers stated in NETA ATS, Paragraph 7.6 Circuit Breakers. Do not perform optional tests. Certify compliance with test parameters.
  - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
  - 3. Perform the following infrared scan tests and inspections and prepare reports:
    - a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each panelboard. Remove front panels so joints and connections are accessible to portable scanner.
    - b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each panelboard 11 months after date of Substantial Completion.
    - c. Instruments and Equipment:
      - 1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
- E. Panelboards will be considered defective if they do not pass tests and inspections.

### 3.5 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.
- B. Set field-adjustable circuit-breaker trip ranges as indicated.
- C. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes. Prior to making circuit changes to achieve load balancing, inform BSRO of effect on phase color coding.
  - 1. Measure loads during period of normal facility operations.
  - 2. Perform circuit changes to achieve load balancing outside normal facility operation schedule or at times directed by BSRO. Avoid disrupting services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
  - 3. After changing circuits to achieve load balancing, recheck loads during normal facility operations. Record load readings before and after changing circuits to achieve load balancing.
  - 4. Tolerance: Maximum difference between phase loads, within a panelboard, shall not exceed 20 percent.

### 3.6 PROTECTION

- A. Temporary Heating: Prior to energizing panelboards, apply temporary heat to maintain temperature according to manufacturer's written instructions.

END OF SECTION 262416



CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 262416 – PANELBOARDS

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the panelboards are installed and are in general conformance with the Contract Documents, applicable Codes, and shop drawings. The panelboards have been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

PANELBOARD INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_



## SECTION 262713 - ELECTRICITY METERING

## 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 equipment for electricity metering by utility company.

## 1.3 DEFINITIONS

- A. KY Pulse: Term used by the metering industry to describe a method of measuring consumption of electricity that is based on a relay opening and closing in response to the rotation of the disk in the meter.
- B. PC: Personal computer.

## 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For electricity-metering equipment.
  - 1. Dimensioned plans and sections or elevation layouts.
  - 2. Wiring Diagrams: For power, signal, and control wiring. Identify terminals and wiring designations and color-codes to facilitate installation, operation, and maintenance. Indicate recommended types, wire sizes, and circuiting arrangements for field-installed wiring, and show circuit protection features.

## 1.5 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

## 1.6 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

## 1.7 COORDINATION

- A. Electrical Service Connections: Coordinate with utility companies and components they furnish as follows:
  - 1. Comply with requirements of utilities providing electrical power services.

## ELECTRICITY METERING

2. Coordinate installation and connection of utilities and services, including provision for electricity-metering components.

## PART 2 - PRODUCTS

### 2.1 EQUIPMENT FOR ELECTRICITY METERING BY UTILITY COMPANY

- A. Meters will be furnished by utility company.
- B. Current-Transformer Cabinets: Comply with requirements of electrical-power utility company.
- C. Meter Sockets: Comply with requirements of electrical-power utility company.
- D. Meter Sockets: Steady-state and short-circuit current ratings shall meet indicated circuit ratings.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Comply with equipment installation requirements in NECA 1.
- B. Install meters furnished by utility company. Install raceways and equipment according to utility company's written requirements. Provide empty conduits for metering leads and extend grounding connections as required by utility company.
- C. Install modular meter center according to NECA 400 switchboard installation requirements.

### 3.2 IDENTIFICATION

- A. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
  1. Series Combination Warning Label: Self-adhesive type, with text as required by NFPA 70.
  2. Equipment Identification Labels: Adhesive film labels with clear protective overlay. For residential meters, provide an additional card holder suitable for printed, weather-resistant card with occupant's name.

### 3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
  1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- B. Tests and Inspections:
  1. Connect a load of known kilowatt rating, 1.5 kW minimum, to a circuit supplied by metered feeder.
  2. Turn off circuits supplied by metered feeder and secure them in off condition.

3. Run test load continuously for eight hours minimum, or longer, to obtain a measurable meter indication. Use test-load placement and setting that ensures continuous, safe operation.
  4. Check and record meter reading at end of test period and compare with actual electricity used, based on test-load rating, duration of test, and sample measurements of supply voltage at test-load connection. Record test results.
- C. Electricity metering will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

END OF SECTION 262713

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 262713 – ELECTRICITY METERING

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the electricity metering is installed and is in general conformance with the Contract Documents, applicable Codes, and shop drawings. The electricity metering has been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

ELECTRICITY METERING INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_

## SECTION 262726 - WIRING DEVICES

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Receptacles, receptacles with integral GFCI, and associated device plates.
  - 2. Twist-locking receptacles.
  - 3. Isolated-ground receptacles.
  - 4. Tamper-resistant receptacles.
  - 5. Weather-resistant receptacles.
  - 6. Snap switches and wall-box dimmers.
  - 7. Wall-switch and exterior occupancy sensors.
  - 8. Communications outlets.
  - 9. Pendant cord-connector devices.
  - 10. Cord and plug sets.
  - 11. Floor service outlets, service poles, and multioutlet assemblies.

## 1.3 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
- D. RFI: Radio-frequency interference.
- E. UTP: Unshielded twisted pair.

## 1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Receptacles for Owner-Furnished Equipment: Match plug configurations.
  - 2. Cord and Plug Sets: Match equipment requirements.

## 1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

## 1.6 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

## 1.7 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

## 1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Service/Power Poles: One for every 10, but no fewer than one.
  - 2. Floor Service-Outlet Assemblies: [One for every 10] <Insert quantities>, but no fewer than [one] <Insert number>.

# PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Eaton (Arrow Hart).
  - 2. Hubbell Incorporated; Wiring Device-Kellems.
  - 3. Leviton Manufacturing Co., Inc.
  - 4. Pass & Seymour/Legrand (Pass & Seymour).
- B. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

## 2.2 GENERAL WIRING-DEVICE REQUIREMENTS

- A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.
- C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
  - 1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
  - 2. Devices shall comply with the requirements in this Section.

## 2.3 STRAIGHT-BLADE RECEPTACLES

- A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:



- a. Eagle.
  - b. Hubbell Incorporated; Wiring Device-Kellems.
  - c. Leviton Manufacturing Co., Inc.
  - d. Pass & Seymour/Legrand (Pass & Seymour).
  - e. Slater.
- B. Isolated-Ground, Duplex Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Eagle.
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).
    - e. Slater.
  - 2. Description: Straight blade; equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.
- C. Tamper-Resistant Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498 Supplement sd, and FS W-C-596.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Eagle.
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).
    - e. Slater.

## 2.4 GFCI RECEPTACLES

- A. General Description:
  - 1. Straight blade, feed-through type.
  - 2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.
  - 3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.
- B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Eagle.
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).
    - e. Slater.
- C. Tamper-Resistant GFCI Convenience Receptacles, 125 V, 20 A:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Eagle.
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Pass & Seymour/Legrand (Pass & Seymour).
    - d. Slater.

## 2.5 TWIST-LOCKING RECEPTACLES

- A. Single Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration L5-20R, and UL 498.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Eagle.
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).
    - e. Slater.
- B. Isolated-Ground, Single Convenience Receptacles, 125 V, 20 A:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Eagle.
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).
    - e. Slater.
  - 2. Description:
    - a. Comply with NEMA WD 1, NEMA WD 6 Configuration L5-20R, and UL 498.
    - b. Equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.

## 2.6 PENDANT CORD-CONNECTOR DEVICES

- A. Description:
  - 1. Matching, locking-type plug and receptacle body connector.
  - 2. NEMA WD 6 Configurations L5-20P and L5-20R, heavy-duty grade, and FS W-C-596.
  - 3. Body: Nylon, with screw-open, cable-gripping jaws and provision for attaching external cable grip.
  - 4. External Cable Grip: Woven wire-mesh type made of high-strength, galvanized-steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector.

## 2.7 CORD AND PLUG SETS

- A. Description:
  - 1. Match voltage and current ratings and number of conductors to requirements of equipment being connected.
  - 2. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and ampacity of at least 130 percent of the equipment rating.
  - 3. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

## 2.8 TOGGLE SWITCHES

- A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

- B. Switches, 120/277 V, 20 A:
1. Single Pole:
    - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) Eagle.
      - 2) Hubbell Incorporated; Wiring Device-Kellems.
      - 3) Leviton Manufacturing Co., Inc.
      - 4) Pass & Seymour/Legrand (Pass & Seymour).
      - 5) Slater.
  2. Two Pole:
    - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) Eagle.
      - 2) Hubbell Incorporated; Wiring Device-Kellems.
      - 3) Leviton Manufacturing Co., Inc.
      - 4) Pass & Seymour/Legrand (Pass & Seymour).
      - 5) Slater.
  3. Three Way:
    - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) Eagle.
      - 2) Hubbell Incorporated; Wiring Device-Kellems.
      - 3) Leviton Manufacturing Co., Inc.
      - 4) Pass & Seymour/Legrand (Pass & Seymour).
      - 5) Slater.
  4. Four Way:
    - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) Eagle.
      - 2) Hubbell Incorporated; Wiring Device-Kellems.
      - 3) Leviton Manufacturing Co., Inc.
      - 4) Pass & Seymour/Legrand (Pass & Seymour).
      - 5) Slater.

## 2.9 WALL PLATES

- A. Single and combination types shall match corresponding wiring devices.
1. Plate-Securing Screws: Metal with head color to match plate finish.
  2. Material for Finished Spaces: Brushed Stainless Steel.
  3. Material for Unfinished Spaces: Brushed Stainless Steel.
  4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.
- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

## 2.10 FLOOR SERVICE FITTINGS

- A. Type: Modular, flush-type, dual-service units suitable for wiring method used.
- B. Compartments: Barrier separates power from voice and data communication cabling.
- C. Service Plate: Rectangular with satin finish.

- D. Power Receptacle: NEMA WD 6 Configuration 5-20R, gray finish, unless otherwise indicated.
- E. Voice and Data Communication Outlet: Blank cover with bushed cable opening.

## 2.11 SERVICE POLES

- A. Description:
  - 1. Factory-assembled and -wired units to extend power and voice and data communication from distribution wiring concealed in ceiling to devices or outlets in pole near floor.
  - 2. Poles: Nominal 2.5-inch- (65-mm-) square cross section, with height adequate to extend from floor to at least 6 inches (150 mm) above ceiling, and with separate channels for power wiring and voice and data communication cabling.
  - 3. Mounting: Ceiling trim flange with concealed bracing arranged for positive connection to ceiling supports; with pole foot and carpet pad attachment.
  - 4. Finishes: Manufacturer's standard painted finish and trim combination.
  - 5. Wiring: Sized for minimum of five No. 12 AWG power and ground conductors and a minimum of four, four-pair, Category 3 or Category 5 voice and data communication cables.
  - 6. Power Receptacles: Two duplex, 20-A, straight-blade receptacles complying with requirements in this Section.
  - 7. Voice and Data Communication Outlets: Blank insert with bushed cable opening with jacks as required on drawings.

## 2.12 FINISHES

- A. Device Color:
  - 1. Wiring Devices Connected to Normal Power System: Ivory unless otherwise indicated or required by NFPA 70 or device listing.
  - 2. Isolated-Ground Receptacles: Ivory with an orange triangle.
- B. Wall Plate Color: Brushed Stainless Steel.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.
- B. Coordination with Other Trades:
  - 1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
  - 2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
  - 3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
  - 4. Install wiring devices after all wall preparation, including painting, is complete.
- C. Conductors:

1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
  2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
  3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
  4. Existing Conductors:
    - a. Cut back and pigtail, or replace all damaged conductors.
    - b. Straighten conductors that remain and remove corrosion and foreign matter.
    - c. Pigtail existing conductors is permitted, provided the outlet box is large enough.
- D. Device Installation:
1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
  2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
  3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
  4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
  5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
  6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
  7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
  8. Tighten unused terminal screws on the device.
  9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.
- E. Receptacle Orientation:
1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the right.
- F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.
- G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.
- H. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.
- 3.2 GFCI RECEPTACLES
- A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.
- 3.3 IDENTIFICATION
- A. Comply with Section 260553 "Identification for Electrical Systems."

- B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

### 3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
  - 1. Test Instruments: Use instruments that comply with UL 1436.
  - 2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.
- B. Tests for Convenience Receptacles:
  - 1. Line Voltage: Acceptable range is 105 to 132 V.
  - 2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
  - 3. Ground Impedance: Values of up to 2 ohms are acceptable.
  - 4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
  - 5. Using the test plug, verify that the device and its outlet box are securely mounted.
  - 6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.
- C. Wiring device will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

END OF SECTION 262726

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 262726 – WIRING DEVICES

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the wiring devices are installed and are in general conformance with the Contract Documents, applicable Codes, and shop drawings. The wiring devices have been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

WIRING DEVICE INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_





## SECTION 262813 - FUSES

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Cartridge fuses rated 600 V ac and less for use in the following:
    - a. Enclosed switches.
  - 2. Spare-fuse cabinets.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for spare-fuse cabinets. Include the following for each fuse type indicated:
  - 1. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.
    - a. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
    - b. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.
  - 2. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
  - 3. Coordination charts and tables and related data.

## 1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

## 1.5 FIELD CONDITIONS

- A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F (5 deg C) or more than 100 deg F (38 deg C), apply manufacturer's ambient temperature adjustment factors to fuse ratings.

## PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Bussmann, an Eaton business.
  - 2. Edison; a brand of Bussmann by Eaton.
  - 3. Littelfuse, Inc.
  - 4. Mersen USA.
- B. Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.

## 2.2 CARTRIDGE FUSES

- A. Characteristics: NEMA FU 1, current-limiting, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.
  - 1. Type RK-1: 250-V, zero- to 600-A rating, 200 kAIC, time delay.
  - 2. Type RK-5: 250-V, zero- to 600-A rating, 200 kAIC, time delay.
  - 3. Type CC: 600-V, zero- to 30-A rating, 200 kAIC, fast acting.
  - 4. Type CD: 600-V, 31- to 60-A rating, 200 kAIC, fast acting.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with NEMA FU 1 for cartridge fuses.
- D. Comply with NFPA 70.
- E. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

## 2.3 SPARE-FUSE CABINET

- A. Characteristics: Wall-mounted steel unit with full-length, recessed piano-hinged door and key-coded cam lock and pull.
  - 1. Size: Adequate for storage of spare fuses specified with 15 percent spare capacity minimum.
  - 2. Finish: Gray, baked enamel.
  - 3. Identification: "SPARE FUSES" in 1-1/2-inch- (38-mm-) high letters on exterior of door.
  - 4. Fuse Pullers: For each size of fuse, where applicable and available, from fuse manufacturer.

## PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.

- B. Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.
- C. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.
- D. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 FUSE APPLICATIONS

- A. Cartridge Fuses:
  - 1. Motor Branch Circuits: Class RK1, time delay.
  - 2. Power Electronics Circuits: Class J, high speed.
  - 3. Other Branch Circuits: Class RK1, time delay.
  - 4. Control Transformer Circuits: Class CC, time delay, control transformer duty.

### 3.3 INSTALLATION

- A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.
- B. Install spare-fuse cabinet(s) in location shown on the Drawings or as indicated in the field by Construction Manager.

### 3.4 IDENTIFICATION

- A. Install labels complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems" and indicating fuse replacement information inside of door of each fused switch and adjacent to each fuse block, socket, and holder.

END OF SECTION 262813

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 262813 – FUSES

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the fuses are installed and are in general conformance with the Contract Documents, applicable Codes, and shop drawings. The fuses have been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

FUSE INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_

## SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Fusible switches.
  - 2. Nonfusible switches.

## 1.3 DEFINITIONS

- A. NC: Normally closed.
- B. NO: Normally open.
- C. SPDT: Single pole, double throw.

## 1.4 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
  - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

## 1.5 ACTION SUBMITTALS

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
  - 1. Enclosure types and details for types other than NEMA 250, Type 1.
  - 2. Current and voltage ratings.
  - 3. Short-circuit current ratings (interrupting and withstand, as appropriate).
  - 4. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
- B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.
  - 1. Wiring Diagrams: For power, signal, and control wiring.

## 1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Seismic Qualification Certificates: For enclosed switches and circuit breakers, accessories, and components, from manufacturer.
  - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
  - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
  - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C. Field quality-control reports.
  - 1. Test procedures used.
  - 2. Test results that comply with requirements.
  - 3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
- D. Manufacturer's field service report.

## 1.7 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
  - 1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.

## 1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
  - 2. Fuse Pullers: Two for each size and type.

## 1.9 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA or an NRTL.
  - 1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.
- B. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.
- C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

- D. 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.
- E. Comply with NFPA 70.

#### 1.10 PROJECT CONDITIONS

- A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
  - 1. Ambient Temperature: Not less than minus 22 deg F (minus 30 deg C) and not exceeding 104 deg F (40 deg C).
  - 2. Altitude: Not exceeding 6600 feet (2010 m).

#### 1.11 COORDINATION

- A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

### PART 2 - PRODUCTS

#### 2.1 FUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. ABB Inc.
  - 2. Eaton.
  - 3. General Electric Company.
  - 4. Siemens Industry, Inc.
  - 5. Square D; by Schneider Electric.
- B. Type GD, General Duty, Single Throw, 240-V ac, 800 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with cartridge fuse interiors to accommodate specified fuses, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.
- C. Accessories:
  - 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
  - 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
  - 3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
  - 4. Lugs: Mechanical type, suitable for number, size, and conductor material.
  - 5. Service-Rated Switches: Labeled for use as service equipment.

#### 2.2 NONFUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Eaton.

2. General Electric Company.
  3. Siemens Industry, Inc.
  4. Square D; by Schneider Electric.
- B. Type GD, General Duty, Single Throw, 600 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.
- C. Accessories:
1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
  2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
  3. Isolated Ground Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
  4. Lugs: Mechanical type, suitable for number, size, and conductor material.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 INSTALLATION

- A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- B. Comply with mounting and anchoring requirements specified in Section 260548.16 "Seismic Controls for Electrical Systems."
- C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- D. Install fuses in fusible devices.
- E. Comply with NECA 1.

#### 3.3 IDENTIFICATION

- A. Comply with requirements in Section 260553 "Identification for Electrical Systems."
  1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
  2. Label each enclosure with engraved metal or laminated-plastic nameplate.



### 3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
  - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- B. Acceptance Testing Preparation:
  - 1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
  - 2. Test continuity of each circuit.
- C. Tests and Inspections:
  - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
  - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
  - 3. Perform the following infrared scan tests and inspections and prepare reports:
    - a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Remove front panels so joints and connections are accessible to portable scanner.
    - b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each enclosed switch and circuit breaker 11 months after date of Substantial Completion.
    - c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
  - 4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

### 3.5 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

END OF SECTION 262816

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 262816 – ENCLOSED SWITCHES AND CIRCUIT BREAKERS

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the enclosed switches and circuit breakers are installed and are in general conformance with the Contract Documents, applicable Codes, and shop drawings. The enclosed switches and circuit breakers have been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

ENCLOSED SWITCHES AND CIRCUIT BREAKER INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_

## SECTION 265119 - LED INTERIOR LIGHTING

## PART 1 - PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Interior solid-state luminaires that use LED technology.
  - 2. Lighting fixture supports.
- B. Related Requirements:
  - 1. Section 260923 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.

## 1.3 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color Rendering Index.
- C. Fixture: See "Luminaire."
- D. IP: International Protection or Ingress Protection Rating.
- E. LED: Light-emitting diode.
- F. Lumen: Measured output of lamp and luminaire, or both.
- G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

## 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Arrange in order of luminaire designation.
  - 2. Include data on features, accessories, and finishes.
  - 3. Include physical description and dimensions of luminaires.
  - 4. Include emergency lighting units, including batteries and chargers.
  - 5. Include life, output (lumens, CCT, and CRI), and energy efficiency data.
  - 6. Photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing and Calculation Guides, of each lighting fixture type. The adjustment factors shall be for lamps and accessories identical to those indicated for the lighting fixture as applied in this Project.

- a. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
  - b. Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.
- B. Shop Drawings: For nonstandard or custom luminaires.
  - 1. Include plans, elevations, sections, and mounting and attachment details.
  - 2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 3. Include diagrams for power, signal, and control wiring.
- C. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling 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. Lighting luminaires.
  - 2. Suspended ceiling components.
  - 3. Partitions and millwork that penetrate the ceiling or extend to within 12 inches (300 mm) of the plane of the luminaires.
  - 4. Structural members to which equipment and or luminaires will be attached.
  - 5. Initial access modules for acoustical tile, including size and locations.
  - 6. Items penetrating finished ceiling, including the following:
    - a. Other luminaires.
    - b. Air outlets and inlets.
    - c. Speakers.
    - d. Sprinklers.
    - e. Access panels.
  - 7. Moldings.
- B. Qualification Data: For testing laboratory providing photometric data for luminaires.
- C. Seismic Qualification Certificates: For luminaires, accessories, and components, from manufacturer.
  - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
  - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
- D. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- E. Product Certificates: For each type of luminaire.
- F. Sample warranty.

## 1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.
  - 1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

## 1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Lamps: Ten for every 100 of each type and rating installed. Furnish at least one of each type.
  - 2. Diffusers and Lenses: One for every 100 of each type and rating installed. Furnish at least one of each type.
  - 3. Globes and Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.

## 1.8 QUALITY ASSURANCE

- A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.
- B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products, and complying with the applicable IES testing standards.
- C. Provide luminaires from a single manufacturer for each luminaire type.
- D. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

## 1.9 DELIVERY, STORAGE, AND HANDLING

- A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

## 1.10 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
- B. Warranty Period: Five year(s) from date of Substantial Completion.

## PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

- A. Subject to compliance with project requirements, provide products as manufactured by the following to the extent as specified hereinafter:
  - 1. Cree Lighting, Racine, WI. Contact: Steve Friedman, National Accounts Manager; Telephone: (262) 504-5479 Cell: (847) 830-1444. Email: steve.friedman@cree.com.

## 2.2 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Luminaires shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- B. Seismic Performance: Luminaires and lamps shall be labeled vibration and shock resistant.
  - 1. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified."

## 2.3 LUMINAIRE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.
- C. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.
- D. Recessed Fixtures: Comply with NEMA LE 4.
- E. Bulb shape complying with ANSI C79.1.
- F. Lamp base complying with ANSI C81.61 or IEC 60061-1.
- G. Lamps dimmable from 100 percent to 0 percent of maximum light output.
- H. Internal driver.

## 2.4 CYLINDER

- A. Subject to compliance with requirements, provide cylinders with integral mounting provisions by Cree Lighting.

## 2.5 DOWNLIGHT

- A. Subject to compliance with requirements, provide downlight fixtures with universal mounting bracket and integral junction box with conduit fittings by Cree Lighting.

## 2.6 HIGHBAY, LINEAR

- A. Subject to compliance with requirements, provide highbay, linear fixtures by Cree Lighting.

## 2.7 HIGHBAY, NONLINEAR

- A. Subject to compliance with requirements, provide highbay, non-linear fixtures with universal mounting brackets and integral junction boxes with conduit fittings, by Cree Lighting.

## 2.8 LINEAR INDUSTRIAL

- A. Subject to compliance with requirements, provide linear industrial fixtures by Cree Lighting. Provide the following housing and heat sink rates:
  - 1. Class 1, Division 2 Group(s) A B C and D.
  - 2. IP 54.
  - 3. IP 66.
  - 4. CSA C22.2 No 137.

## 2.9 LOWBAY

- A. Subject to compliance with requirements, provide lowbay fixtures with universal mounting brackets, by Cree Lighting.

## 2.10 RECESSED LINEAR

- A. Subject to compliance with requirements, provide recessed linear fixtures with integral junction boxes with conduit fittings, by Cree Lighting.

## 2.11 STRIP LIGHT

- A. Subject to compliance with requirements, provide strip light fixtures with integral junction boxes with conduit fittings, by Cree Lighting.

## 2.12 SURFACE MOUNT, LINEAR

- A. Subject to compliance with requirements, provide surface-mounted linear fixtures with integral junction boxes with conduit fittings, by Cree Lighting.

## 2.13 SURFACE MOUNT, NONLINEAR

- A. Subject to compliance with requirements, provide surface-mounted non-linear fixtures with integral junction boxes with conduit fittings, by Cree Lighting.

## 2.14 SUSPENDED, LINEAR

- A. Subject to compliance with requirements, provide linear suspended fixtures by Cree Lighting.

## 2.15 SUSPENDED, NONLINEAR

- A. Subject to compliance with requirements, provide non-linear, suspended fixtures with integral junction boxes with conduit fittings, by Cree Lighting.

## 2.16 MATERIALS

- A. Metal Parts:
  - 1. Free of burrs and sharp corners and edges.
  - 2. Sheet metal components shall be steel unless otherwise indicated.
  - 3. Form and support to prevent warping and sagging.
- B. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
- C. Diffusers and Globes:
  - 1. Prismatic acrylic.
  - 2. Acrylic Diffusers: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
  - 3. Glass: Annealed crystal glass unless otherwise indicated.
  - 4. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless otherwise indicated.
- D. Housings:
  - 1. Extruded-aluminum housing and heat sink.
  - 2. Clear, anodized finish.
- E. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
  - 1. Label shall include the following lamp characteristics:
    - a. "USE ONLY" and include specific lamp type.
    - b. Lamp diameter, shape, size, wattage, and coating.
    - c. CCT and CRI for all luminaires.

## 2.17 METAL FINISHES

- A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

## 2.18 LUMINAIRE FIXTURE SUPPORT COMPONENTS

- A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: 1/2-inch (13-mm) steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.
- C. Wires: ASTM A 641/A 641 M, Class 3, soft temper, zinc-coated steel, 12 gage (2.68 mm).



- D. Rod Hangers: 3/16-inch (5-mm) minimum diameter, cadmium-plated, threaded steel rod.
- E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before fixture installation. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 TEMPORARY LIGHTING

- A. If approved by the Construction Manager, use selected permanent luminaires for temporary lighting. When construction is sufficiently complete, clean luminaires used for temporary lighting and install new lamps.

#### 3.3 INSTALLATION

- A. Comply with NECA 1.
- B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.
- C. Install lamps in each luminaire.
- D. Supports:
  - 1. Sized and rated for luminaire weight.
  - 2. Able to maintain luminaire position after cleaning and relamping.
  - 3. Provide support for luminaire without causing deflection of ceiling or wall.
  - 4. Luminaire mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and vertical force of 400 percent of luminaire weight.
- E. Flush-Mounted Luminaire Support:
  - 1. Secured to outlet box.
  - 2. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
  - 3. Trim ring flush with finished surface.
- F. Wall-Mounted Luminaire Support:
  - 1. Attached to structural members in walls.
  - 2. Do not attach luminaires directly to gypsum board.
- G. Ceiling-Mounted Luminaire Support:
  - 1. Ceiling mount with two 5/32-inch- (4-mm-) diameter aircraft cable supports.
  - 2. Ceiling mount with pendant mount with 5/32-inch- (4-mm-) diameter aircraft cable supports.

3. Ceiling mount with hook mount.

H. Suspended Luminaire Support:

1. Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.
2. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
3. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of luminaire chassis, including one at each end.
4. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.

I. Ceiling-Grid-Mounted Luminaires:

1. Secure to any required outlet box.
2. Secure luminaire to the luminaire opening using approved fasteners in a minimum of four locations, spaced near corners of luminaire.
3. Use approved devices and support components to connect luminaire to ceiling grid and building structure in a minimum of four locations, spaced near corners of luminaire.

- J. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

### 3.4 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

### 3.5 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.

- B. Luminaire will be considered defective if it does not pass operation tests and inspections.

- C. Prepare test and inspection reports.

### 3.6 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.

1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
3. Adjust the aim of luminaires in the presence of the Construction Manager.

END OF SECTION 265119

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 265119 – LED INTERIOR LIGHTING

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the LED interior lighting is installed and is in general conformance with the Contract Documents, applicable Codes, and shop drawings. The LED interior lighting has been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

LED INTERIOR LIGHTING INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address) Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address) Phone Number: (    ) \_\_\_\_\_



## SECTION 265219 - EMERGENCY AND EXIT LIGHTING

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Emergency lighting units.
  - 2. Exit signs.
  - 3. Luminaire supports.

## 1.3 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color Rendering Index.
- C. Emergency Lighting Unit: A lighting unit with internal or external emergency battery powered supply and the means for controlling and charging the battery and unit operation.
- D. Fixture: See "Luminaire" Paragraph.
- E. Lumen: Measured output of lamp and luminaire, or both.
- F. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

## 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of emergency lighting unit, exit sign, and emergency lighting support.
  - 1. Include data on features, accessories, and finishes.
  - 2. Include physical description of the unit and dimensions.
  - 3. Battery and charger for light units.
  - 4. Include life, output of luminaire (lumens, CCT, and CRI), and energy-efficiency data.
  - 5. Include photometric data and adjustment factors based on laboratory tests, complying with IES LM-45, for each luminaire type.
    - a. Testing Agency Certified Data: For indicated luminaires and signs, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.
    - b. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
- B. Product Schedule:

1. For emergency lighting units. Use same designations indicated on Drawings.
2. For exit signs. Use same designations indicated on Drawings.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling 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. Luminaires.
  2. Suspended ceiling components.
  3. Partitions and millwork that penetrate the ceiling or extend to within 12 inches (300 mm) of the plane of the luminaires.
  4. Structural members to which equipment will be attached.
  5. Size and location of initial access modules for acoustical tile.
  6. Items penetrating finished ceiling including the following:
    - a. Other luminaires.
    - b. Air outlets and inlets.
    - c. Speakers.
    - d. Ceiling-mounted projectors.
    - e. Sprinklers.
    - f. Access panels.
  7. Moldings.
- B. Qualification Data: For testing laboratory providing photometric data for luminaires.
- C. Product Certificates: For each type of luminaire.
- D. Seismic Qualification Certificates: For luminaires, accessories, and components, from manufacturer.
  1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
  2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
  3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- E. Sample Warranty: For manufacturer's special warranty.

#### 1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For luminaires and lighting systems to include in emergency, operation, and maintenance manuals.
  1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

#### 1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  1. Lamps: 10 for every 100 of each type and rating installed. Furnish at least one of each type.
  2. Luminaire-mounted, emergency battery pack: One for every 20 emergency lighting units. Furnish at least one of each type.

3. Diffusers and Lenses: One for every 100 of each type and rating installed. Furnish at least one of each type.
4. Globes and Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.

## 1.8 QUALITY ASSURANCE

- A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.
- B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products, and complying with the applicable IES testing standards.
- C. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

## 1.9 DELIVERY, STORAGE, AND HANDLING

- A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

## 1.10 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
  1. Warranty Period: Two year(s) from date of Substantial Completion.
- B. Special Warranty for Emergency Lighting Batteries: Manufacturer's standard form in which manufacturer of battery-powered emergency lighting unit agrees to repair or replace components of rechargeable batteries that fail in materials or workmanship within specified warranty period.
  1. Warranty Period for Emergency Power Unit Batteries: 5 years from date of Substantial Completion. Full warranty shall apply for first year and prorated warranty for the remaining four years.
  2. Warranty Period for Emergency Fluorescent Ballast and Self-Powered Exit Sign Batteries: Seven years from date of Substantial Completion. Full warranty shall apply for first year and prorated warranty for the remaining six years.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Luminaires shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
  1. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified."

## 2.2 GENERAL REQUIREMENTS FOR EMERGENCY LIGHTING

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. NRTL Compliance: Fabricate and label emergency lighting units, exit signs, and batteries to comply with UL 924.
- C. Comply with NFPA 70 and NFPA 101.
- D. Comply with NEMA LE 4 for recessed luminaires.
- E. Comply with UL 1598 for fluorescent luminaires.
- F. Lamp Base: Comply with ANSI C81.61.
- G. Bulb Shape: Complying with ANSI C79.1.
  - 1. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
    - a. Ambient Temperature: Less than 0 deg F (minus 18 deg C) or exceeding 104 deg F (40 deg C), with an average value exceeding 95 deg F (35 deg C) over a 24-hour period.
    - b. Ambient Storage Temperature: Not less than minus 4 deg F (minus 20 deg C) and not exceeding 140 deg F (60 deg C).
    - c. Humidity: More than 95 percent (condensing).
    - d. Altitude: Exceeding 3300 feet (1000 m).
  - 2. Nightlight Connection: Operate lamp continuously at 100 percent of rated light output.
  - 3. Test Push-Button and Indicator Light: Visible and accessible without opening luminaire or entering ceiling space.
    - a. Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
    - b. Indicator Light: LED indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
  - 4. Battery: Sealed, maintenance-free, type as indicated on drawings.
  - 5. Charger: Fully automatic, solid-state, constant-current type with sealed power transfer relay.
  - 6. Remote Test: Switch in handheld remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.
  - 7. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

## 2.3 EMERGENCY LIGHTING

- A. General Requirements for Emergency Lighting Units: Self-contained units.
- B. Emergency Luminaires:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. Cree.
- C. Emergency Lighting Unit:



1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - a. Cree Lighting.
- D. Remote Emergency Lighting Units:
  1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. Cree Lighting.

## 2.4 EXIT SIGNS

- A. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.
- B. Internally Lighted Signs:
  1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. Cree Lighting.
  2. Self-Powered Exit Signs (Battery Type): Internal emergency power unit.

## 2.5 MATERIALS

- A. Metal Parts:
  1. Free of burrs and sharp corners and edges.
  2. Sheet metal components shall be steel unless otherwise indicated.
  3. Form and support to prevent warping and sagging.
- B. Doors, Frames, and Other Internal Access:
  1. Smooth operating, free of light leakage under operating conditions.
  2. Designed to permit relamping without use of tools.
  3. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
- C. Diffusers and Globes:
  1. Tempered Fresnel glass.
  2. Acrylic: 100 percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
  3. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless otherwise indicated.
- D. Housings:
  1. Extruded aluminum housing.
  2. Clear anodized finish.
- E. Conduit: Electrical metallic tubing, minimum 3/4 inch (21 mm) in diameter.

## 2.6 METAL FINISHES

- A. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## 2.7 LUMINAIRE SUPPORT COMPONENTS

- A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.
- B. Support Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage (2.68 mm).

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for conditions affecting performance of luminaires.
- B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before luminaire installation.
- C. Examine walls, floors, roofs, and ceilings for suitable conditions where emergency lighting luminaires will be installed.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Comply with NECA 1.
- B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.
- C. Install lamps in each luminaire.
- D. Supports:
  - 1. Sized and rated for luminaire and emergency power unit weight.
  - 2. Able to maintain luminaire position when testing emergency power unit.
  - 3. Provide support for luminaire and emergency power unit without causing deflection of ceiling or wall.
  - 4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire and emergency power unit weight and vertical force of 400 percent of luminaire weight.
- E. Wall-Mounted Luminaire Support:
  - 1. Attached to structural members in walls.
  - 2. Do not attach luminaires directly to gypsum board.
- F. Suspended Luminaire Support:
  - 1. Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.
  - 2. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
  - 3. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of luminaire chassis, including one at each end.

4. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.

G. Ceiling Grid Mounted Luminaires:

1. Secure to any required outlet box.
2. Secure emergency power unit using approved fasteners in a minimum of four locations, spaced near corners of emergency power unit.
3. Use approved devices and support components to connect luminaire to ceiling grid and building structure in a minimum of four locations, spaced near corners of luminaire.

### 3.3 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

### 3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
1. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.
- B. Luminaire will be considered defective if it does not pass operation tests and inspections.
- C. Prepare test and inspection reports.

### 3.5 STARTUP SERVICE

- A. Perform startup service:
1. Charge emergency power units and batteries minimum of one hour and depress switch to conduct short-duration test.
  2. Charge emergency power units and batteries minimum of 24 hours and conduct one-hour discharge test.

### 3.6 ADJUSTING

- A. Adjustments: Within 12 months of date of Substantial Completion, provide on-site visit to do the following:
1. Inspect all luminaires. Replace lamps, emergency power units, batteries, signs, or luminaires that are defective.
    - a. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
  2. Conduct short-duration tests on all emergency lighting.

END OF SECTION 265219

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 265219 – EMERGENCY AND EXIT LIGHTING

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the emergency and exit lighting is installed and is in general conformance with the Contract Documents, applicable Codes, and shop drawings. The emergency and exit lighting has been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

EMERGENCY AND EXIT LIGHTING INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_

## SECTION 265619 - EXTERIOR LIGHTING

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Exterior solid-state luminaires that are designed for and exclusively use LED lamp technology.
  - 2. Luminaire supports.
- B. Related Requirements:
  - 1. Section 260923 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.
  - 2. Section 265613 "Lighting Poles and Standards" for poles and standards used to support exterior lighting equipment.

## 1.3 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color rendering index.
- C. Fixture: See "Luminaire."
- D. IP: International Protection or Ingress Protection Rating.
- E. Lumen: Measured output of lamp and luminaire, or both.
- F. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

## 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of luminaire.
  - 1. Arrange in order of luminaire designation.
  - 2. Include data on features, accessories, and finishes.
  - 3. Include physical description and dimensions of luminaire.
  - 4. Lamps, include life, output (lumens, CCT, and CRI), and energy-efficiency data.
  - 5. Photometric data and adjustment factors based on laboratory tests, complying with IES Lighting Measurements Testing and Calculation Guides, of each luminaire type. The adjustment factors shall be for lamps and accessories identical to those indicated for the luminaire as applied in this Project.

- a. Manufacturer's Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the NVLAP for Energy Efficient Lighting Products.
  - 6. Wiring diagrams for power, control, and signal wiring.
  - 7. Means of attaching luminaires to supports and indication that the attachment is suitable for components involved.
- B. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

## 1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
- 1. Luminaires.
  - 2. Structural members to which equipment and luminaires will be attached.
  - 3. Underground utilities and structures.
  - 4. Existing underground utilities and structures.
  - 5. Above-grade utilities and structures.
  - 6. Existing above-grade utilities and structures.
  - 7. Building features.
  - 8. Vertical and horizontal information.
- B. Qualification Data: For testing laboratory providing photometric data for luminaires.
- C. Seismic Qualification Certificates: For luminaires, accessories, and components, from manufacturer.
- 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
  - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
  - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- D. Source quality-control reports.
- E. Sample warranty.

## 1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For luminaires to include in operation and maintenance manuals.
- 1. Provide a list of all lamp types used on Project. Use ANSI and manufacturers' codes.
  - 2. Provide a list of all photoelectric relay types used on Project; use manufacturers' codes.

## 1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
- 1. Lamps: Ten for every 100 of each type and rating installed. Furnish at least one of each type.
  - 2. Glass, Acrylic, and Plastic Lenses, Covers, and Other Optical Parts: One for every 100 of each type and rating installed. Furnish at least one of each type.

3. Diffusers and Lenses: One for every 100 of each type and rating installed. Furnish at least one of each type.
4. Globes and Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.

#### 1.8 QUALITY ASSURANCE

- A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturers' laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.
- B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products and complying with applicable IES testing standards.
- C. Provide luminaires from a single manufacturer for each luminaire type.
- D. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.
- E. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

#### 1.9 DELIVERY, STORAGE, AND HANDLING

- A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering prior to shipping.

#### 1.10 FIELD CONDITIONS

- A. Verify existing and proposed utility structures prior to the start of work associated with luminaire installation.
- B. Mark locations of exterior luminaires for approval by BSRO prior to the start of luminaire installation.

#### 1.11 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
  1. Failures include, but are not limited to, the following:
    - a. Structural failures, including luminaire support components.
    - b. Faulty operation of luminaires and accessories.
    - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
  2. Warranty Period: 2 year(s) from date of Substantial Completion.

## PART 2 - PRODUCTS

## 2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Luminaires shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- B. Seismic Performance: Luminaires and lamps shall be labeled vibration and shock resistant.
  - 1. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified."

## 2.2 LUMINAIRE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. NRTL Compliance: Luminaires shall be listed and labeled for indicated class and division of hazard by an NRTL.
- C. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.
- D. UL Compliance: Comply with UL 1598 and listed for wet location.
- E. Lamp base complying with ANSI C81.61.
- F. Bulb shape complying with ANSI C79.1.
- G. Internal driver.
- H. Lamp Rating: Lamp marked for outdoor use.
- I. Source Limitations: Obtain luminaires from single source from a single manufacturer.

## 2.3 LUMINAIRE TYPES

- A. Area and Site – refer to light fixture schedule.

## 2.4 MATERIALS

- A. Metal Parts: Free of burrs and sharp corners and edges.
- B. Sheet Metal Components: Corrosion-resistant aluminum. Form and support to prevent warping and sagging.
- C. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses.



- D. Diffusers and Globes:
  - 1. Acrylic Diffusers: 100 percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
  - 2. Glass: Annealed crystal glass unless otherwise indicated.
  - 3. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless otherwise indicated.
- E. Lens and Refractor Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.
- F. Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:
  - 1. White Surfaces: 85 percent.
  - 2. Specular Surfaces: 83 percent.
  - 3. Diffusing Specular Surfaces: 75 percent.
- G. Housings:
  - 1. Rigidly formed, weather- and light-tight enclosure that will not warp, sag, or deform in use.
  - 2. Provide filter/breather for enclosed luminaires.
- H. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
  - 1. Label shall include the following lamp characteristics:
    - a. "USE ONLY" and include specific lamp type.
    - b. Lamp diameter, shape, size, wattage and coating.
    - c. CCT and CRI for all luminaires.

## 2.5 FINISHES

- A. Variations in Finishes: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- B. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.
- C. Factory-Applied Finish for Steel Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
  - 1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1 or SSPC-SP 8.
  - 2. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.
    - a. Color: As selected from manufacturer's standard catalog of colors.
    - b. Color: As selected by Architect from manufacturer's full range.

## 2.6 LUMINAIRE SUPPORT COMPONENTS

- A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

## PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for luminaire electrical conduit to verify actual locations of conduit connections before luminaire installation.
- C. Examine walls, roofs, for suitable conditions where luminaires will be installed.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 TEMPORARY LIGHTING

- A. If approved by the BSRO, use selected permanent luminaires for temporary lighting. When construction is substantially complete, clean luminaires used for temporary lighting and install new lamps.

## 3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Comply with NECA 1.
- B. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.
- C. Install lamps in each luminaire.
- D. Fasten luminaire to structural support.
- E. Supports:
  - 1. Sized and rated for luminaire weight.
  - 2. Able to maintain luminaire position after cleaning and relamping.
  - 3. Support luminaires without causing deflection of finished surface.
  - 4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.
- F. Wall-Mounted Luminaire Support:
  - 1. Attached to structural members in walls.
- G. Wiring Method: Install cables in raceways. Conceal raceways and cables.
- H. Install luminaires level, plumb, and square with finished grade unless otherwise indicated.
- I. Coordinate layout and installation of luminaires with other construction.
- J. Adjust luminaires that require field adjustment or aiming. Include adjustment of photoelectric device to prevent false operation of relay by artificial light sources, favoring a north orientation.

- K. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" and 260533 "Raceways and Boxes for Electrical Systems" for wiring connections and wiring methods.

### 3.4 CORROSION PREVENTION

- A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.
- B. Steel Conduits: Comply with Section 260533 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch- (0.254-mm-) thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

### 3.5 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

### 3.6 FIELD QUALITY CONTROL

- A. Inspect each installed luminaire for damage. Replace damaged luminaires and components.
- B. Perform the following tests and inspections:
  - 1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
  - 2. Verify operation of photoelectric controls.
- C. Illumination Tests:
  - 1. Measure light intensities at night. Use photometers with calibration referenced to NIST standards. Comply with the following IES testing guide(s):
    - a. IES LM-5.
    - b. IES LM-50.
    - c. IES LM-52.
    - d. IES LM-64.
    - e. IES LM-72.
  - 2. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
- D. Luminaire will be considered defective if it does not pass tests and inspections.
- E. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

### 3.7 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain luminaires.

## 3.8 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.
1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
  2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
  3. Adjust the aim of luminaires in the presence of the BSRO Construction Manager.

END OF SECTION 265619

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 265619 – LED EXTERIOR LIGHTING

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the LED exterior lighting is installed and is in general conformance with the Contract Documents, applicable Codes, and shop drawings. The LED exterior lighting has been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

LED EXTERIOR LIGHTING INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_



## **SECTION 283100 – INTRUSION ALARM SYSTEM**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section Includes:
  - 1. Intrusion detection with communication links to perform monitoring, alarm, and control functions.
  - 2. Integration of other electronic and electrical systems and equipment.

#### **1.3 DEFINITIONS**

- A. PIR: Passive infrared.
- B. RFI: Radio-frequency interference.
- C. Control Unit: System component that monitors inputs and controls outputs through various circuits.
- D. Master Control Unit: System component that accepts inputs from other control units and may also perform control-unit functions. The unit has limited capacity for the number of protected zones and is installed at an unattended location or at a location where it is not the attendant's primary function to monitor the security system.
- E. Monitoring Station: Facility that receives signals and has personnel in attendance at all times to respond to signals. A central station is a monitoring station that is listed.
- F. Protected Zone: A protected premises or an area within a protected premises that is provided with means to prevent an unwanted event.
- G. Standard Intruder: A person who weighs 100 lb (45 kg) or less and whose height is 60 inches (1525 mm) or less; dressed in a long-sleeved shirt, slacks, and shoes
- H. Standard-Intruder Movement: Any movement, such as walking, running, crawling, rolling, or of a "standard intruder" in a protected zone.
- I. Systems Integration: The bringing together of components of several systems containing interacting components to achieve indicated functional operation of combined systems.
- J. Zone: A defined area within a protected premises. It is a space or area for which an intrusion must be detected and uniquely identified. The sensor or group of sensors must then be assigned to perform the detection, and any interface equipment between sensors and communication must link to master control unit.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: Components for sensing, detecting, and control, including dimensions and data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: Detail assemblies of standard components that are custom assembled for specific application on this Project.
  - 1. Functional Block Diagram: Show single-line interconnections between components including interconnections between components specified in this Section and those furnished under other Sections. Indicate methods used to achieve systems integration. Indicate control, signal, and data communication paths and identify control interface devices and media to be used. Describe characteristics of network and other data communication lines.
    - a. Indicate methods used to achieve systems integration.
    - b. Indicate control, signal, and data communication paths and identify PLCs, networks, control interface devices, and media to be used.
    - c. Describe characteristics of network and other data communication lines.
    - d. Describe methods used to protect against power outages and transient voltages including types and ratings of isolation and surge suppression devices used in data, communication, signal, control, and ac and dc power circuits.
  - 2. Raceway Riser Diagrams: Detail raceway runs required for intrusion detection. Include designation of devices connected by raceway, raceway type and size, and type and size of wire and cable fill for each raceway run.
  - 3. Site and Floor Plans: Indicate final outlet and device locations, routing of raceways, and cables inside and outside the building.
  - 4. Device Address List: Coordinate with final system programming.
  - 5. System Wiring Diagrams: Include system diagrams unique to Project. Show connections for all devices, components, and auxiliary equipment. Include diagrams for equipment and for system with all terminals and interconnections identified.
  - 6. Details of surge-protection devices and their installation.
  - 7. Sensor detection patterns and adjustment ranges.
- C. Design Data: Include method of operation and supervision of each component and each type of circuit. Show sequence of operations for manually and automatically initiated system or equipment inputs. Description must cover this specific Project; manufacturer's standard descriptions for generic systems are unacceptable.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and intrusion detection systems integrator.
- B. Field quality-control reports.
- C. Product Warranty: Sample of special warranty.
- D. Field Test Reports: Test plan and report defining all tests required to ensure that system meets technical, operational, and performance specifications within 30 days of date of Contract award.



- E. Evaluation Reports: Examination reports documenting inspections of substrates, areas, and conditions.

#### 1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For intrusion detection system to include in emergency, operation, and maintenance manuals. Include the following:
  - 1. Data for each type of product, including features and operating sequences, both automatic and manual.
  - 2. Master control-unit hardware and software data.

#### 1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Intrusion Detection Devices: Furnish quantity equal to one of each type.
  - 2. Fuses: Three of each kind and size.
  - 3. Security Fasteners: Furnish 1 box or fraction thereof, of each type and size of security fastener installed.

#### 1.8 QUALITY ASSURANCE

- A. Installer Qualifications:
  - 1. An employer of workers, at least one of whom is a Certified Alarm Technician, Level 1.
  - 2. Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
  - 3. Layout Responsibility: Preparation of Shop Drawings by a Technician.
  - 4. Installation Supervision: Installation shall be under the direct supervision of a Commercial Installer who shall be present at all times when Work of this Section is performed at Project site.
  - 5. Testing Supervisor: Currently certified as a Technician to supervise on-site testing.
- B. Intrusion Detection Systems Integrator Qualifications: An experienced intrusion detection equipment supplier and Installer who has completed systems integration work for installations similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
  - 1. At least one of whom is a Certified Systems Integrator.

#### 1.9 PROJECT CONDITIONS

- A. Environmental Conditions: Capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:
  - 1. Altitude: Sea level to 6,000 feet (1220 m).
  - 2. Interior, Controlled Environment: System components installed in temperature-controlled interior environments shall be rated for continuous operation in ambient of 36 to 122 degrees F (2 to 50 degrees C) dry bulb and 20 to 90 percent relative humidity, noncondensing.

## 1.10 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer and Installer agree to repair or replace components of intrusion detection devices and equipment that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two (2) years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. The following products are deemed acceptable:

1. System: Honeywell VISTA-20P Control
2. Keypad: Honeywell 6150
3. 360-degree Motion Sensor: Honeywell DT7360
4. Wall-mount Motion Sensor: Honeywell IS25100TC
5. Holdup Button: Honeywell 270R

### 2.2 FUNCTIONAL DESCRIPTION OF SYSTEM

- A. Description: Hard-wired, modular, microprocessor-based controls, intrusion sensors and detection devices, and communication links to perform monitoring, alarm, and control functions.
- B. Supervision: System components shall be continuously monitored for normal, alarm and trouble conditions. Indicate deviations from normal conditions at any location in system. Indication includes identification of device or circuit in which deviation has occurred and whether deviation is an alarm or malfunction.
1. Alarm Signal: Display at master control unit and actuate audible and visual alarm devices.
  2. Trouble Condition Signal: Distinct from other signals, indicating that system is not fully functional. Trouble signal shall indicate system problems such as battery failure, open or shorted transmission line conductors, or control-unit failure.
  3. Supervisory Condition Signal: Distinct from other signals, indicating an abnormal condition as specified for the particular device or control unit.
- C. System Control: Master control unit shall directly monitor intrusion detection units and connecting wiring.
- D. System Control: Master control unit shall directly monitor intrusion detection devices, perimeter detection units, and control units associated with perimeter detection units, and connecting wiring in a multiplexed distributed control system or as part of a network.
- E. System shall automatically reboot program without error or loss of status or alarm data after any system disturbance.
- F. Operator Commands:

1. Help with System Operation: Display all commands available to operator. Help command, followed by a specific command, shall produce a short explanation of the purpose, use, and system reaction to that command.
  2. Acknowledge Alarm: To indicate that alarm message has been observed by operator.
  3. Place Protected Zone in Access: Disable all intrusion-alarm circuits of a specific protected zone. Tamper circuits may not be disabled by operator.
  4. Place Protected Zone in Secure: Activate all intrusion-alarm circuits of a protected zone.
  5. Protected Zone Test: Initiate operational test of a specific protected zone.
  6. System Page: Initiate system-wide operational page.
  7. System Immediate Alert: Single-button activation for external alerting
- G. Timed Control at Master Control Unit: Allow automatically timed "secure" and "access" functions of selected protected zones.
- H. Automatic Control of Related Systems: Alarm or supervisory signals from certain intrusion detection devices control the following functions in related systems
1. Open a signal path between certain intercommunication stations.
  2. Shift sound system to "listening mode" and open a signal path to certain system speakers.
- I. Response Time: Two (2) seconds between actuation of any alarm and its indication at master control unit.
- J. Circuit Supervision: Supervise all signal and data transmission lines, links with other systems, and sensors from master control unit. Indicate circuit and detection device faults with both protected zone and trouble signals, sound a distinctive audible tone, and illuminate an LED. Maximum permissible elapsed time between occurrence of a trouble condition and indication at master control unit is 20 seconds. Initiate an alarm in response to opening, closing, shorting, or grounding of a signal or data transmission line.
- K. Programmed Secure-Access Control: System shall be programmable to automatically change status of various combinations of protected zones between secure and access conditions at scheduled times. Status changes may be preset for repetitive, daily, and weekly; specially scheduled operations may be preset up to a year in advance. Manual secure-access control stations shall override programmed settings.
- L. Manual Secure-Access Control: Coded entries at manual stations shall change status of associated protected zone between secure and access conditions.

## 2.3 SYSTEM COMPONENT REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Control Units, Devices, and Communications with Monitoring Station: Listed and labeled by a qualified testing agency for compliance with SIA CP-01.
- C. FM Global Compliance: FM-Approved and -labeled intrusion detection devices and equipment.
- D. Comply with NFPA 70.

- E. Compatibility: Detection devices and their communication features, connecting wiring, and master control unit shall be selected and configured with accessories for full compatibility with the following equipment:
  - 1. Door hardware specified by Architectural plans.
- F. Surge Protection: Protect components from voltage surges originating external to equipment housing and entering through power, communication, signal, control, or sensing leads. Include surge protection for external wiring of each conductor entry connection to components.
  - 1. Minimum Protection for Power Lines 120 V and More: Auxiliary panel suppressors complying manufacturers installation instructions.
  - 2. Minimum Protection for Communication, Signal, Control, and Low-Voltage Power Lines: Listed and labeled by a qualified testing agency for compliance with NFPA 731.
- G. Intrusion Detection Units: Listed and labeled by a qualified testing agency for compliance with UL 639.
- H. Interference Protection: Components shall be unaffected by radiated RFI and electrical induction of 15 V/m over a frequency range of 10 to 10,000 MHz and conducted interference signals up to 0.25-V rms injected into power supply lines at 10 to 10,000 MHz.
- I. Self-Testing Devices: Automatically test themselves periodically, but not less than once per hour, to verify normal device functioning and alarm initiation capability. Devices transmit test failure to master control unit.
- J. Antimasking Devices: Automatically check operation continuously or at intervals of a minute or less, and use signal-processing logic to detect blocking, masking, jamming, tampering, or other operational dysfunction. Devices transmit detection of operational dysfunction to master control unit as an alarm signal.
- K. Addressable Devices: Transmitter and receivers shall communicate unique device identification and status reports to master control unit.

## 2.4 ENCLOSURES

- A. Interior Sensors: Enclosures that protect against dust, falling dirt, and dripping noncorrosive liquids.
- B. Interior Electronics: NEMA 250, Type 12.
- C. Exterior Electronics: NEMA 250, Type 4X, Fiberglass
- D. Corrosion Resistant: NEMA 250, Type 4X, PVC
- E. Screw Covers: Where enclosures are readily accessible, secure with security fasteners of type appropriate for enclosure.

## 2.5 SECURE AND ACCESS DEVICES

- A. Keypad and Display Module: Arranged for entering and executing commands for system-status changes and for displaying system-status and command-related data.

## 2.6 PIR SENSORS (MOTION DETECTORS)

- A. Listed and labeled by a qualified testing agency for compliance with SIA PIR-01.
- B. Description: Sensors detect intrusion by monitoring infrared wavelengths emitted from a human body within their protected zone and by being insensitive to general thermal variations.
  - 1. Wall-Mounted Unit Maximum Detection Range: 125 percent of indicated distance for individual units and not less than 50 feet (15 m).
  - 2. Ceiling-Mounted Unit Spot-Detection Pattern: Full 360-degree conical.
  - 3. Ceiling-Mounted Unit Pattern Size: 84-inch (2135-mm) diameter at floor level for units mounted 96 inches (2440 mm) above floor; 18-foot (5.5-m) diameter at floor level for units mounted 25 feet (7.6 m) above floor.

## 2.7 MICROWAVE-PIR DUAL-TECHNOLOGY SENSORS

- A. Description: Single unit combining a sensor that detects changes in microwave signals and a PIR sensor that detects changes in ambient level of infrared emissions caused by standard-intruder movement within detection pattern.
- B. Listed and labeled by a qualified testing agency for compliance with SIA PIR-01.
- C. Device Performance: An alarm is transmitted when either sensor detects a standard intruder within a period of three to eight seconds from when the other sensor detects a standard intruder.
  - 1. Minimum Detection Pattern: A room 20 by 30 feet (6 by 9 m).
  - 2. PIR Sensor Sensitivity: Adjustable pattern coverage to detect a change in temperature of 2 deg F (1 deg C) or less, and standard-intruder movement within sensor's detection patterns at any speed between 0.3 to 7.5 fps (0.09 to 2.3 m/s) across two adjacent segments of detector's field of view.
  - 3. Microwave Sensor Sensitivity: Adjustable, able to detect standard-intruder movement within sensor's detection pattern at any speed between 0.3 to 7.5 fps (0.09 to 2.3 m/s). Sensor sensitivity adjustments shall be accessible only when sensor housing is removed, and sensors shall comply with 47 CFR 15.
  - 4. Self-Test: When initiated by power-up, trouble conditions and programmed intervals, start a test sequence for each detector element that simulates standard-intruder movement within sensor's detection patterns, causing an alarm.

## 2.8 DURESS-ALARM SWITCHES (HOLD UP BUTTON)

- A. Description: A plunger-type switch that allows an individual to covertly send a duress signal to master control unit, with no visible or audible indication when activated. Switch shall selectively lock in activated position or be momentarily-activated.

## 2.9 AUDIBLE ALARM DEVICES (SIRENS)

- A. Siren: 15-W speaker with siren driver, rated to produce a minimum sound output of 115 dB at 10 feet (3 m) from master control unit.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of intrusion detection.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations of intrusion detection connections before intrusion detection installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of intrusion detection.
- D. Inspect built-in and cast-in anchor installations, before installing intrusion detection, to verify that anchor installations comply with requirements. Prepare inspection reports.
  - 1. Remove and replace anchors where inspections indicate that they do not comply with requirements. Re-inspect after repairs or replacements are made.
  - 2. Perform additional inspections to determine compliance of replaced or additional anchor installations. Prepare inspection reports.
- E. For material whose orientation is critical for its performance as a ballistic barrier, verify installation orientation.
- F. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 SYSTEM INSTALLATION

- A. Comply with UL 681 and NFPA 731.
- B. Equipment Mounting: Install master control unit on finished floor with tops of cabinets not more than 72 inches (1830 mm) above the finished floor.
- C. Install wall-mounted equipment, with tops of cabinets not more than 72 inches (1830 mm) above the finished floor.

### 3.3 WIRING INSTALLATION

- A. Wiring Method: Install wiring in metal raceways according to the National Electrical Code. Conceal raceway except in unfinished spaces and as indicated. Minimum conduit size shall be 1/2 inch (13 mm). Control and data transmission wiring shall not share conduit with other building wiring systems.
- B. Wiring Method: Install wiring in metal raceways according to the National Electrical Code, except in accessible indoor ceiling spaces and in interior hollow gypsum board partitions where cable may be used. Conceal raceways and wiring except in unfinished spaces and as indicated. Minimum conduit size shall be 1/2 inch (13 mm). Control and data transmission wiring shall not share conduit with other building wiring systems.
- C. Wiring Method: Cable, concealed in accessible ceilings, walls, and floors when possible.
- D. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points. Use lacing bars and distribution spools. Separate power-limited and non-power-limited conductors as recommended in writing by manufacturer. Install conductors parallel with or at right angles

to sides and back of enclosure. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with intrusion system to terminal blocks. Mark each terminal according to system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

E. Wires and Cables:

1. Conductors: Size as recommended in writing by system manufacturer unless otherwise indicated.
2. 120-V Power Wiring: Install according to the National Electrical Code unless otherwise indicated.
3. Control and Signal Transmission Conductors: Install unshielded, twisted-pair cable unless otherwise indicated or if manufacturer recommends shielded cable.

F. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

G. Install power supplies and other auxiliary components for detection devices at control units unless otherwise indicated or required by manufacturer. Do not install such items near devices they serve.

H. Identify components with engraved, laminated-plastic or metal nameplate for master control unit and each terminal cabinet, mounted with corrosion-resistant screws.

### 3.4 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals.

B. Install instructions frame in a location visible from master control unit.

### 3.5 GROUNDING

A. Ground the master control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to master control unit.

B. Ground system components and conductor and cable shields to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

C. Signal Ground Terminal: Locate at main equipment rack or cabinet. Isolate from power system and equipment grounding.

D. Install grounding electrodes of type, size, location, and quantity indicated. Comply with installation requirements in the National Electrical Code.

### 3.6 FIELD QUALITY CONTROL

A. Pretesting: After installation, align, adjust, and balance system and perform complete pretesting to determine compliance of system with requirements in the Contract Documents. Correct deficiencies observed in pretesting. Replace malfunctioning or damaged items with new ones and retest until satisfactory performance and conditions are achieved. Prepare forms for systematic recording of acceptance test results.

1. Report of Pretesting: After pretesting is complete, provide a letter certifying that installation is complete and fully operable; include names and titles of witnesses to preliminary tests.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- C. Perform tests and inspections.
  1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- D. Tests and Inspections: Comply with provisions in NFPA 731, Ch. 9, "Testing and Inspections."
  1. Inspection: Verify that units and controls are properly labeled and interconnecting wires and terminals are identified.
  2. Test Methods: Intrusion detection systems and other systems and equipment that are associated with detection and accessory equipment shall be tested according to Table "Test Methods" and Table "Test Methods of Initiating Devices."
- E. Documentation: Comply with provisions in NFPA 731, Ch. 4, "Documentation."
- F. Tag all equipment, stations, and other components for which tests have been satisfactorily completed.

### 3.7 ADJUSTING

- A. Occupancy Adjustments: When requested within three (3) months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to three (3) visits to Project during other-than-normal occupancy hours for this purpose.

### 3.8 DEMONSTRATION

- A. Contractor representative to assist Owner's maintenance personnel to adjust, operate, and maintain the intrusion detection system. Comply with documentation provisions in NFPA 731, Ch. 4, "Documentation and User Training."

END OF SECTION 28 31 00



CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 281300 – INTRUSION ALARM SYSTEM

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the security alarm conduit is installed and is in general conformance with the Contract Documents, applicable Codes, and shop drawings. The security alarm conduit has been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

INTRUSION ALARM SYSTEM INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address) Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address) Phone Number: (    ) \_\_\_\_\_



## SECTION 283133 – ADDRESSABLE FIRE ALARM SYSTEM

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes the following:
  - 1. Addressable Fire Alarm Control Panel
  - 2. Digital Alarm Communicator Transmitter
  - 3. IP Communicator
  - 4. Circuits
  - 5. System Smoke Detectors
  - 6. System Heat Detectors
  - 7. Addressable Interface Modules
  - 8. Manual Pull Stations
  - 9. Notification Appliances
  - 10. Remote Annunciators
  - 11. Documentation Cabinet
  - 12. Phone Suppression Modules

#### 1.3 DEFINITIONS

- A. AHJ: Authority Having Jurisdiction
- B. DACT: Digital Alarm Communicator Transmitter
- C. FACP: Fire Alarm Control Panel
- D. FAEM: Fire Alarm Equipment Manufacturer
- E. IDC: Initiating Device Circuit
- F. NAC: Notification Appliance Circuit
- G. NICET: National Institute for Certification in Engineering Technologies
- H. NFPA: National Fire Protection Association
- I. NRTL: Nationally Recognized Testing Laboratory
- J. SLC: Signaling Line Circuit
- K. UL: Underwriters Laboratories, Inc.

#### 1.4 REFERENCES

- A. All work shall be installed in accordance with all applicable codes and referenced design standards.
- B. If there is a conflict between the applicable codes, referenced design standards, or local amendments and this specification, it is the Contractor's responsibility to immediately bring the conflict to the Owner's Representative and Engineer for resolution.

#### 1.5 SYSTEM OPERATIONAL DESCRIPTION

- A. The fire alarm system shall be a non-coded, addressable system, with automatic sensitivity control of certain smoke detectors and multiplexed signal transmission, dedicated to fire alarm service only.

- B. The system shall operate as a low voltage fire alarm system and shall be a complete intelligent addressable supervised fire alarm system as hereinafter specified. Initiation circuits shall meet the minimum requirements of Class B. Supervisory circuits shall meet the minimum requirements of Class B. Notification circuits shall meet the minimum requirements of Class B. Signaling line circuits shall meet the minimum requirements of Class B. Auxiliary circuits, where not installed as signaling line circuits, shall meet the minimum requirements of a Class B, Style W notification circuit. Circuits for relay coil operation shall be 24 volt maximum with a separate or integral field collapsing diode.
- C. The control panels and power supplies shall receive their power from 120 volt AC dedicated branch circuits. The circuit disconnecting means shall have a red marking, shall be accessible only to authorized personnel, and shall be identified as "FIRE ALARM CIRCUIT". The 24 volt DC power for all system initiation, supervisory, notification and control circuits shall be provided by the fire alarm control panel power supplies or listed power supplies.
- D. System Operation shall be as follows:
1. Upon loss of building power, the entire system shall transfer to secondary power within ten (10) seconds, and without loss of signals. The system shall operate under secondary power in normal or trouble conditions for twenty-four (24) hours and have sufficient power to support complete alarm condition operation for a subsequent five (5) minutes of evacuation alarm operation at maximum connected load.
  2. Abnormal circuit conditions or devices, as required for the Class and Style of the circuit, shall initiate a "trouble" condition at the control panels and remote annunciators for that specific circuit or device. The "trouble" indication shall describe the nature of the condition on the affected circuit or device. The fire alarm system shall transmit a "trouble" condition to an approved supervising station.
  3. Activation of any supervisory device shall initiate a "supervisory" condition at the control panels and remote annunciators for that specific device. The "supervisory" indication shall describe the nature of the condition and specific address and alphanumeric description of the device affected. The fire alarm system shall transmit a point specific "supervisory" condition to an approved supervising station.
  4. Activation of any alarm device shall initiate an "alarm" condition at the control panels and remote annunciators for that specific device. The "alarm" indication shall describe the nature of the condition and specific address and alphanumeric description of the device affected. The fire alarm system shall transmit a point specific "alarm" condition to an approved supervising station.
- E. Initiation of an "alarm" condition shall result in the following functions to be performed by the system:
1. Initiate an alarm indication on the control panel by tone and illuminate the corresponding device specific alphanumeric LCD description. Manually activating the "Alarm Silence" shall silence the tone at the panel. The alarm alphanumeric display shall remain "On" at the control panel until the condition causing the alarm has been cleared and reset. An additional alarm reported to the panel subsequent to activating the "Alarm Silence" shall reactivate the control panel tone.
  2. Activate the audible and visual notification appliances throughout the building.
  3. Manually activating the "Alarm Silence" at the panel shall de-energize the audible and visual notification appliances. An additional alarm reported to the panel subsequent to activating the "Alarm Silence" shall re-energize the audible and visual notification appliances in the building.
  4. Transmit a point specific "alarm" signal to the approved supervising station.

- F. Actuation of alarm notification appliances, fire safety functions, and annunciation at the protected premises shall occur within ten (10) seconds after the activation of an initiating device.

#### 1.6 DESCRIPTION OF WORK

- A. Provide all required labor, warranty labor, materials, equipment, system programming, testing, submittals and services necessary for a complete and operational fire alarm system as hereinafter described, and as shown on the engineering drawings.
- B. Provide a minimum of two (2) hours training, for staff personnel, in the operation and use of the system.
- C. It is intended that the engineering drawings and specifications shall describe and provide for a working installation complete in every detail and all items necessary for such complete installation shall be provided whether or not specifically mentioned herein or shown on the engineering drawings.

#### 1.7 SUBMITTALS

- A. The engineering drawings have been prepared using AutoCAD. These documents will be made available either in electronic or hard copy form. Utilization of these documents for the development of shop drawings and submittals does not relieve the Contractor from any responsibilities required herein.
- B. Submittals will be disapproved unless required equipment literature, calculations, and complete shop drawings are submitted together as one package for review.
- C. In the submittals, the Contractor shall provide a complete package with drawings, equipment literature and calculations as one package for review. The submittal shall be complete in nature and in accordance with the Shop Drawing provisions of NFPA 72. The system.
  - 1. Shop Drawings. The specific quantity to be submitted shall be confirmed with the General Contractor and Owner. Electronic submittals are acceptable. Submittal must be comprehensive of the entire project, complete in all detail, and include, but not be limited to, the following:
    - a. Floor plans showing equipment placement, point to point wiring, wiring types and sizes, conduit types and sizes, wiring and raceway routes, and proposed mounting methods for conduit and backboxes. Floor plans shall be AutoCAD generated.
    - b. Sequence of Operations in Matrix form to include a detailed description of the operation of each system function for all possible conditions.
    - c. Riser diagram showing typical wiring connections for each type of device and module.
    - d. Detailed wiring diagrams for major system components (control panels, power supplies, etc.).
    - e. Supervisory and alarm current calculations for primary power and emergency battery sizing of all control panels and auxiliary power supplies.
      - 1) Battery calculations shall list the type of devices and modules, quantities, amperage draw for standby and alarm conditions for

- each device, the total amperage draw for each panel, and each panel's battery amp/hour rating.
    - 2) The calculated load shall be the design load, including all required spare capacity.
    - 3) The battery calculations shall include a twenty (20) percent safety margin to the calculated amp-hour rating.
  - f. A complete list of all proposed alphanumeric descriptions and their associated point address and circuit number.
  - g. Voltage drop calculations for all notification appliance circuits.
    - 1) Calculations shall follow the voltage drop calculation criteria as outlined in NFPA 72 and UL 864.
    - 2) Calculations shall use the worst case operating voltage of each control panel or power supply as a starting voltage. The starting voltage shall be 20.4 VDC, unless written documentation is provided confirming that the specific control panel or power supply is capable of maintaining a voltage higher than 20.4 VDC.
    - 3) Calculations shall use the lowest operating voltage of the notification appliances and the associated increased current draw. The lowest operating voltage shall be the UL standard operating voltage of 16 VDC, unless approved otherwise by the Engineer.
- 2. Manufacturer's literature on all system equipment. The specific quantity to be submitted shall be confirmed with the General Contractor and Owner. Electronic submittals are acceptable.
  - a. Literature shall include specification and description of recommended supporting methods, enclosures or boxes, and wiring connections.
  - b. The exact components to be utilized on this specific project shall be indicated, by highlighting or arrows, on each data sheet of the equipment literature.
- 3. Qualifications and authorization of the representative of the FAEM.
- D. The Engineer shall review for accuracy all submittals required to be received by the Engineer prior to equipment release or installation. The Owner, Owner's Representative, or design firms retained by the Owner shall not be responsible for any additional costs resulting from replacement of equipment or materials not reviewed prior to installation.
- E. After satisfactory review of the submittals by the Engineer, the Contractor shall submit all required drawings, manufacturers' literature, calculations and any other materials required by the AHJ to obtain a permit to the appropriate party for review.

## 1.8 PROJECT RECORD DOCUMENTS

- A. The Contractor shall provide and maintain on site an up-to-date record set of satisfactory shop drawings which shall be marked to show each and every change made to the fire alarm system from the original approved shop drawings. This shall not be construed as authorization to deviate from or make changes to the shop drawings reviewed by the Engineer without written instructions from the Engineer in each case. This set of drawings shall be issued only as a record set. These drawings shall be made available to the Owner, or the Owner's Representative, upon request.

- B. The preparation of a record of completion shall be in accordance with NFPA 72. Record of completion shall include, but not be limited to, the following:
  - 1. A final copy of the record of completion shall be provided after completion of the operational acceptance tests.
  - 2. This copy shall be updated to reflect all system additions or modifications and maintained in a current condition at all times.
  - 3. All documents shall be located in separate enclosure or cabinet. Location of documentation cabinet shall be coordinated with AHJ prior to installation and labeled "SYSTEM RECORD DOCUMENTS".
- C. Prior to final payment for the fire alarm system and the beginning of the warranty period, submit a CD ROM and two (2) sets (or as directed by the Owner's Representative) of the following completed project record documents to the Owner's Representative:
  - 1. Copies of all test and inspection reports as required by the AHJ and NFPA 72:
    - a. The Record of Completion form and The Inspection and Testing form shall be in the format as outlined in NFPA 72.
  - 2. All permits and licenses required to be in the possession of the Owner by the AHJ.
  - 3. Accurate record (as-built) drawings of the complete installation to include, but not be limited to, the information required for the shop drawings. Record drawings of the floor plans shall be AutoCAD generated.
  - 4. Original warranty documents including, but not limited to, those of the FAEM. Warranty documents shall reference and be binding to the warranty provisions specified in the warrant portion of this specification.
  - 5. A detailed description of routine maintenance required or recommended, or as would be provided under a maintenance contract, including a testing schedule and detailed maintenance instructions for each type of device installed

#### 1.9 QUALITY ASSURANCE

- A. All work shall meet the requirements of the Owner, Architect, Engineer and Authority Having Jurisdiction (AHJ).
- B. All equipment and components shall be UL listed, for the actual intended use, unless hereinafter specifically excluded from such a listing.
- C. Installation and supervision of installation shall be in strict compliance with the requirements of the regulations, licenses, and permits for fire alarm system installers in this jurisdiction.
- D. Installer must have been actively engaged in the business of selling, installing, and servicing fire alarm systems for at least five (5) years. Installer must be an authorized representative of the FAEM and have technical factory training specifically for the system proposed.
- E. The FAEM shall have a representative supervise the final connection of devices, wiring, and programming of the control panels. The FAEM representative shall be NICET certified as Level II or higher Fire Alarm Protection / Fire Alarm Systems Engineering Technician.

#### 1.10 SOFTWARE SERVICE AGREEMENT

- A. Comply with UL 864.

- B. Beginning with Substantial Completion (as determined by the Owner), provide software support for two (2) years.
- C. Update software to latest version at Project completion. Install and program software upgrades that become available within two (2) years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.
  - 1. Provide minimum thirty (30) days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

#### 1.11 REGULATORY REQUIREMENTS

- A. All work shall meet the requirements of all applicable codes and referenced design standards.
- B. No approvals or interpretations of the design documents shall be pursued except through the Engineer.
- C. Any work performed prior to the satisfactory review of the shop drawings by the Engineer, approval by the AHJ, and determined to be noncompliant with the contract documents or applicable codes by the Owner or AHJ will be replaced at the Contractors' expense.
- D. The system will not be acceptable until final testing and receipt of the Inspection and Testing Form has been obtained.

#### 1.12 WARRANTY

- A. Repair all defective workmanship or replace all defective materials for a period of one (1) year from the date of acceptance by the Owner's Representative. Workmanship or equipment found to be defective during that period shall be replaced at no additional cost to the Owner.
- B. The warranty or any part of the warranty shall not be made void by any required operation or inspection of the system after acceptance during the warranty period. The Owner may select qualified firms other than Warrantor to provide required tests and inspections. System testing and inspections will be conducted only by a duly licensed company under contract with the Owner to perform scheduled testing and inspections as required by the AHJ. The Owner may elect to have a representative present at the scheduled testing during the warranty period.

### PART 2 - PRODUCTS

#### 2.1 ACCEPTABLE MANUFACTURERS

- A. Fire-Lite, ES-50X

#### 2.2 FIRE ALARM CONTROL PANELS

- A. Provide control panels that consist of modular components, utilizing solid state programmable microprocessors, to accomplish all system functions. The components shall include but not be limited to the following items:
  - 1. System processing capable of supporting initiation data circuits which can be "T-tapped" at any location on the signaling line circuit (SLC). Any additional



- modules, programming, or circuits required to achieve the specified system capacity shall be provided and installed at no cost to the Owner.
2. System processing capable of supporting addressable analog smoke detection, addressable analog heat detection, addressable pull stations, addressable monitoring modules, and remote addressable control modules. Total system capacity shall support a minimum fifty (50) addressable points. No Data loop shall be assigned more than eighty (80) percent of its point capacity unless approved in writing by the Engineer.
  3. Provide power supplies, transformers, batteries, battery chargers and modules required for a complete and operational system. Provide sufficient output power to the devices to perform the specified functions. Power supply capacity shall not exceed eighty (80) percent of its rated (continuous) capacity
  4. Provide a UL listed cabinet with sufficient space and circuit board slots for the specified equipment. The cabinet shall have a hinged door keyed in common with all other keyed devices throughout the system. If multiple cabinets are required in one location, the cabinets shall be located adjacent to each other and match in finish and design.

### 2.3 DIGITAL ALARM COMMUNICATOR TRANSMITTER

- A. Provide an approved DACT to transmit fire alarm, supervisory and trouble signals to an approved supervising station. The DACT shall be UL listed for commercial fire reporting to an approved supervising station, and shall conform to the requirements of NFPA 72.
- B. The DACT shall operate from a dedicated 120 volt AC or 24 volt DC source with a listed secondary power source conforming to the same alarm and standby time requirements as the FACP.
- C. The DACT shall have the capability to supervise two (2) telephone lines, seize the phone line and send the signal on one or both lines without any additional equipment. The DACT shall have the ability to test each telephone line by sending a test signal to the approved remote monitoring on twenty-four (24) hour intervals and report the loss of either phone line. The communicator shall be able to transmit all signals in the Standard SIA (Security Industry Association) format.
- D. Provided a dedicated phone line for the primary means of transmission. The secondary means shall utilize a voice over internet protocol / secession initiation protocol (VoIP/SIP) connection to owner's network.

### 2.4 SYSTEM SMOKE DETECTORS

- A. Intelligent Photoelectric Smoke Detectors
  1. Provide analog photoelectric type smoke detectors with the capability to send data, on command, to the control panel representing the analog level of smoke density.
  2. Provide a "maintenance alert" feature whereby the detector initiates a trouble condition should the detectors' sensitivity approach the outside limits of the normal sensitivity window.
  3. Provide address-setting means and store an internal identification code for each detector which the control panel can use to identify the type and precise location of the detector.
  4. Provide dual alarm and power/status LED's. Flash status LED's under normal conditions, indicating that the detector is operational and in regular communication with the control panel. Both LED's may be placed into steady illumination by the control panel, indicating that an alarm condition has been detected and verified.
  5. Acceptable Manufacturer is Fire-Lite SD365.

## 2.5 SYSTEM HEAT DETECTORS

### A. Intelligent Thermal Detectors

1. Provide analog thermal fixed temperature and rate-of-rise detectors utilizing dual electronic thermostats to measure temperature levels in its chamber. The detector shall be capable of sending data, on command, to the control panel representing the analog temperature level.
2. The fixed temperature rating shall be one hundred thirty-five (135) degrees Fahrenheit. The rate-of-rise temperature detection shall be fifteen (15) degrees Fahrenheit per minute.
3. Provide address-setting means and store an internal identification code for each detector which the control panel can use to identify the type and precise location of the detector.
4. Provide dual alarm and power/status LED's. Flash status LED's under normal conditions, indicating that the detector is operational and in regular communication with the control panel. Both LED's may be placed into steady illumination by the control panel, indicating that an alarm condition has been detected and verified.
5. Acceptable Manufacturer is Fire-Lite H355(A) / H355R

## 2.6 MANUAL PULL STATIONS

### A. Addressable Manual Pull Stations

1. Provide dual action type manual pull stations. Manual pull stations shall be designed that upon activation, shall initiate a change of status at the control panel. The manual pull stations shall not be automatically resettable and shall include a visible indication of the manual pull station being activated.
2. Provide address-setting means and store an internal identification code which the control panel can use to identify the type of device.
3. Construct of hi-impact red molded Lexan with instructions for station operation in raised white letters.
4. Provide flush mounting of pull stations. Where flush mounting is not possible, bring to the immediate attention of the Engineer of Record for resolution.
5. Provide mounting on backboxes UL listed for use with the pull station.
6. Provide a keyed reset on each pull station.
7. Acceptable Manufacturer is Fire-Lite BG12LX.

### B. Protective Covers for Manual Pull Stations

1. Provide protective cover with integral sounder at manual pull stations, as indicated on the engineering drawings for all common area pull stations.
2. The cover shall be made of clear Lexan material, and shall have an integral sounder with a minimum sound pressure level of eighty-five (85) dBA at ten (10) feet.
3. The sounder shall be powered from a 9 volt DC battery power. Provide all required power circuits and connections.
4. Acceptable manufacturer is STI-1100 Stopper II with Sounder.

## 2.7 ADDRESSABLE INTERFACE MODULES

### A. Monitor Modules

1. Provide addressable monitor modules where required to interface with contact alarm devices, or to connect a supervised zone of conventional initiating devices (any normally open dry contact device) to an intelligent SLC loop.
2. Provide address-setting means and store an internal identification code which the control panel shall use to identify the type of device. Flash status/power LED under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel. The LED may be placed into steady illumination by the control panel, indicating that an alarm condition has been detected. Where status LED is provided, manufacturer provided cover plate with viewing hole shall be provided.
3. Provide an automatic test feature to permit functional testing of the device from the main control panel. Indicate results of the test on the LCD display at the control panel.
4. Monitor modules with multiple input contact connections are acceptable if each input is capable of independent programming and functional operation.
5. Acceptable Manufacturer is Fire-Lite MMF-300.

B. Control/Relay Modules

1. Provide addressable control/relay modules where required to interface with a dry contact (Form C) relay. Provide power for the relay actuation from the intelligent SLC loop.
2. Minimum rating of Form C contacts shall be two (2.0) amperes at 24 volts and one half (0.5) amperes at 120 volts AC.
3. Provide address-setting means and store an internal identification code which the control panel shall use to identify the type of device. Flash status LED under normal conditions, indicating that the control module is operational and in regular communication with the control panel. The LED may be placed into steady illumination by the control panel, indicating that an alarm condition has been detected. Where status LED is provided, manufacturer provided cover plate with viewing hole shall be provided.
4. Control/relay modules with multiple output contact connections are acceptable if each output is capable of independent programming and functional operation.
5. Acceptable Manufacturer is Fire-Lite CMF-300 / CRF-300.

## 2.8 NOTIFICATION APPLIANCES

A. Visual Notification Appliances – Wall Mounted

1. Provide visual notification appliances operable at 24 volt DC and polarized supervision. The appliances shall utilize a high intensity solid state xenon strobe tube with associated lens/reflector system. The appliances shall be constructed of high-impact red thermoplastic, shall indicate "FIRE", and shall be UL listed for wall mounted applications.
2. Where possible, provide flush mounting of appliances. Where flush mounting is not possible, bring to the immediate attention of the Owner's Representative and Engineer of Record for resolution. Where surface mounting is necessary, provide a decorative backbox skirt covering the appliance backbox.
3. Provide synchronization of all visual notification appliances. The synchronization modules shall be capable of synchronizing appliances with candela ratings ranging from 15 cd to 185 cd.
4. Acceptable Manufacturer is System Sensor SRL.

B. Visual Notification Appliances – Ceiling Mounted

1. Provide visual notification appliances operable at 24 volt DC and polarized supervision. The appliances shall utilize a high intensity solid state xenon strobe tube with associated lens/reflector system. The appliances shall be constructed of high-impact red thermoplastic, shall indicate "FIRE", and shall be UL listed for ceiling mounted applications.
2. Where possible, provide flush mounting of appliances. Where flush mounting is not possible, bring to the immediate attention of the Owner's Representative and Engineer of Record for resolution. Where surface mounting is necessary, provide a decorative backbox skirt covering the appliance backbox.
3. Provide synchronization of all visual notification appliances. The synchronization modules shall be capable of synchronizing appliances with candela ratings ranging from 15 cd to 185 cd.
4. Acceptable Manufacturer is System Sensor SCRL.

C. Audible/Visual Notification Appliances - Wall Mounted

1. Provide solid state electronic audible notification appliances with integral visual notification appliance operable at 24 volt DC and polarized supervision. The appliances shall utilize a high intensity solid state xenon strobe tube with associated lens/reflector system. The appliances shall be constructed of high-impact red thermoplastic, shall indicate "FIRE", and shall be UL listed for wall mounted applications.
2. Where possible, provide flush mounting of appliances. Where flush mounting is not possible, bring to the immediate attention of the Owner's Representative and Engineer of Record for resolution. Where surface mounting is necessary, provide a decorative backbox skirt covering the appliance backbox.
3. Provide synchronization of all audible and visual notification appliances. Provide a synchronized temporal pattern audible tone producing a minimum sound pressure level of seventy-five (75) dB reverberant per UL 464 using the A-weighted scale (dBA). The synchronization modules shall be capable of synchronizing appliances with candela ratings ranging from 15 cd to 185 cd.
4. Acceptable Manufacturer is System Sensor P2RL.

D. Audible/Visual Notification Appliances - Ceiling Mounted

1. Provide solid state electronic audible notification appliances with integral visual notification appliance operable at 24 volt DC and polarized supervision. The appliances shall utilize a high intensity solid state xenon strobe tube with associated lens/reflector system. The appliances shall be constructed of high-impact red thermoplastic, shall indicate "FIRE", and shall be UL listed for ceiling mounted applications.
2. Where possible, provide flush mounting of appliances. Where flush mounting is not possible, bring to the immediate attention of the Owner's Representative and Engineer of Record for resolution. Where surface mounting is necessary, provide a decorative backbox skirt covering the appliance backbox.
3. Provide synchronization of all audible and visual notification appliances. Provide a synchronized temporal pattern audible tone producing a minimum sound pressure level of seventy-five (75) dB reverberant per UL 464 using the A-weighted scale (dBA). The synchronization modules shall be capable of synchronizing appliances with candela ratings ranging from 15 cd to 185 cd.
4. Acceptable Manufacturer is System Sensor PC2RL.

E. Exterior Audible/Visual Notification Appliances - Wall Mounted

1. Provide solid state electronic audible notification appliances with integral visual notification appliance operable at 24 volt DC and polarized supervision. The appliances shall utilize a high intensity solid state xenon strobe tube with associated lens/reflector system. The appliances shall be constructed of high-impact red thermoplastic, shall indicate "FIRE" and shall be UL listed for wall mounted applications.
2. Where possible, provide flush mounting of appliances. Where surface mounting is necessary, provide a decorative backbox skirt covering the appliance backbox.
3. Provide appliances UL listed for outdoor (weatherproof) application.
4. Provide mounting on backboxes UL listed for outdoor (weatherproof) application and for use with the appliances.
5. Acceptable Manufacturer is System Sensor P2RK.

## 2.9 ANNUNCIATORS

### A. Remote LCD Annunciator Panel

1. Provide a remote annunciator with a minimum eighty (80) character liquid crystal display (LCD) which mimics the fire alarm control panel display. The remote annunciator shall have an enable key for operation of integral acknowledge, reset and silence switches. The remote annunciator shall derive all operational power from the fire alarm control panel.
2. Acceptable Manufacturer is Fire-Lite ANN-80.

## 2.10 MISCELLANEOUS

### A. Alternating Current Transient Voltage Surge Suppression Modules

1. Provide transient voltage surge suppression modules consisting of silicon avalanche suppressor diode (SASD) technology. Modules shall be designed, manufactured and installed in accordance with UL 1449, the National Electrical Code, and the manufacturer's instructions.
2. Performance specifications shall include a Response Time of less than one (1) nanoseconds.
3. Acceptable Manufacturer is DITEK 120HW.

### B. Low Voltage Transient Voltage Surge Suppression Modules

1. Provide transient voltage surge suppression modules consisting of silicon avalanche suppressor diode (SASD) technology. Modules shall be designed, manufactured and installed in accordance with UL 497B, the National Electrical Code, and the manufacturer's instructions.
2. Performance specifications shall include a Response Time of less than five (5) nanoseconds.
3. Acceptable Manufacturer is DITEK DTK-1LVP-X.

### C. Phone Surge Suppression Module

1. Provide a phone surge suppression modules consisting of 8 pin modular phone connector, built-in tamper loop, and automatic shorting pins for cord removal. Modules shall be designed, manufactured and installed in accordance with FCC part 68, the National Electrical Code, and the manufacturer's instructions.
2. Performance specifications shall include a Response Time less than one (1) nanoseconds, automatically restoring after each surge within the specified ratings.

3. Acceptable manufacturer is ELK-955 series, or equal.

D. Auxiliary Relays

1. Provide relays for all auxiliary control interface. Provide heavy duty type rated up to ten (10) amps at 24 volt DC. Provide with NEMA I dust cover assembly and DPDT contacts.
2. Relays shall be mounted within three (3) feet of the controlled circuit or device.

E. Transformer

1. Provide a UL listed step-down transformer with a primary input voltage 120 volt AC and a secondary output voltage 24 volt AC at a minimum of 25 VA. The transformer shall have enclosed pigtail type primary connections and screw type secondary terminal connections.
2. Provide a fusible device to be connected to the secondary/load side of the transformer for protection of the wiring and devices connected to the transformer. The amperage of the fusible device shall be based on the projected load and a twenty-five (25) percent safety factor.

F. Documentation Cabinet

1. Provide a documentation cabinet of 16 Gauge Steel construction.
2. The documentation cabinet shall be red in color with contrasting text indicating FIRE ALARM DOCUMENTS.
3. The documentation cabinet shall be lockable and keyed in common with all other keyed devices throughout the system.
4. The documentation cabinet shall be sized to contain the following: full size record drawing, equipment data sheets, firmware and software control documentation.
5. Acceptable Manufacturer is Space Age Electronic FAD ACE-11.

G. Remote Test / Annunciator

1. Remote test stations, where indicated on the engineering drawings, shall consist of a key operated switch and indicating LED.
2. The remote test station shall be listed for use with the duct smoke detector.
3. Acceptable Manufacturer is System Sensor RTS151KEY.

## 2.11 CONDUCTORS

- A. Conductors for any power limited circuits shall be type FPL, FPLP, or FPLR.
- B. Conductors for any non-power limited circuits shall be type NPLF, NPLFP, NPLFR or THHN installed in conduit.
- C. Where the size or type of conductor hereinafter specified conflicts with the FAEM's requirements, the larger size or more specialized conductor type will be used.
- D. Conductors for wet locations shall be as follows:
  1. Types RHW, TW, THW, THHW, THWN, XHHW or other type listed for use in wet locations.
  2. Type listed for direct burial.

- E. All electrical characteristics (conductor-to-conductor capacitance, DC resistance, etc.) of the fire alarm conductors shall meet the requirements of the selected FAEM for the intended application.
- F. All fire alarm conductors shall conform to the requirements of Article 760 of the National Electrical Code, and all local codes and standards.
- G. All fire alarm cabling shall be permanently labeled with industry standard labels to clearly indicate the associated circuits. Handwritten labels are not acceptable.

## 2.12 RACEWAY

- A. The following raceway types shall be permitted:
  - 1. EMT conduit (3/4 inch minimum).
  - 2. RIGID conduit (3/4 inch minimum).
  - 3. Non-Metallic conduit for wet locations (3/4 inch minimum).
  - 4. Surface mounted metallic raceway with a minimum size equivalent to three quarter (3/4) inch nominal conduit.
- B. All raceway types shall be new. Installing used raceway is unacceptable.
- C. Using existing raceway is unacceptable without prior written permission of the Engineer or Owner's Representative.
- D. Boxes, supports, and other accessories for the raceway installation shall be listed for the intended application.

## PART 3 - EXECUTION

### 3.1 COORDINATION WITH OTHER TRADES

- A. Coordinate closely with all other trades to expedite construction, accurately interface with related systems and avoid interferences.
- B. Coordinate with the general and electrical contractors for installation and mounting heights of all fire alarm raceway, back-boxes and junction boxes.

### 3.2 INSTALLATION / APPLICATION

- A. Furnish and install all control wiring, raceway and outlet boxes for the fire alarm system.
- B. Furnish and install all backboxes, equipment and devices for the fire alarm system. Backboxes shall be of the exact type recommended by the FAEM as shown on the equipment and device submittals, and installed per manufacturer's recommendations.
- C. All fire alarm conduit, junction boxes, pull boxes, cable splices and terminal cabinets shall be accessible, painted red or clearly marked "Fire Alarm". The Contractor shall comply with any local codes or AHJ requirements for circuit identification. Any access panels required for the accessibility to the junction boxes, pull boxes, cable splices and terminal cabinets shall be the responsibility of the Fire Alarm Contractor.
- D. All wiring conductors and conduits shall be installed in a neat and workmanlike manner at right angles to the building walls, floors and ceilings, and supported from the building structure at intervals compliant with NEC requirements.

- E. All power limited wiring conductors for the fire alarm system shall be installed in conduit in the following locations:
  - 1. Below the structure.
  - 2. Concealed above ceilings or in partitions (subject to physical damage).
  - 3. Where required by applicable codes.
  - 4. Wiring conductors in finished areas that cannot be concealed are allowed to be installed in surface-mounted metallic raceway only upon approval of the Owner's Representative.
- F. All non-power limited wiring conductors for the fire alarm system shall be installed in conduit.
- G. Power limited wiring conductors for the fire alarm system are not required to be installed in conduit in the following locations:
  - 1. Above lay-in ceilings.
  - 2. Where allowed by applicable codes.
  - 3. Concealed in ceilings or partitions not subject to damage.
- H. Exposed wiring conductors and conduits shall be concealed from public view at all locations by routing on the inside of joists, above lay-in ceilings, over girders, within partitions or in any other manner acceptable to the Owner's Representative.
- I. Exposed wiring conductors shall be supported from the building structure at intervals of no more than five (5) feet.
- J. Ground fire alarm control panel and associated circuits shall comply with IEEE 1100. Install a ground wire from main service ground to fire alarm control panel.
- K. All wiring conductors shall be tagged at all junction points and shall test free from grounds or crosses between conductors.
- L. All wiring conductors shall be pulled splice free. The use of wire nuts, crimped connectors, or twisting of conductors is prohibited. All terminations shall be at a terminal strip utilizing screw terminals.
- M. Conductors that are terminated, spliced, or otherwise interrupted in any enclosure, cabinet, mounting, or junction box shall be connected to screw-type terminal blocks.
- N. Power-limited wiring conductors shall not be installed in conduits with electric light, power Class 1, non-power-limited fire alarm and medium power network-powered broadband communications circuits.
- O. Final connections between equipment and the wiring system shall be made under direct supervision of a representative of the FAEM. If other personnel are required by the AHJ to be present during final connections, this shall not relieve the Contractor of the responsibility of providing a representative of the FAEM for direct supervision.
- P. Fire alarm cabling shall not be painted.
- Q. Conduits shall enter the control panel enclosures only in the approved locations, as identified in the FAEM installation instructions.



### 3.3 EQUIPMENT INSTALLATION

- A. Comply with NFPA 72 for installation of fire alarm equipment.
- B. The control panels shall be surface mounted with no operational parts which may require maintenance mounted greater than seventy-two (72) inches above the finished floor. The control panel annunciator shall be mounted so that no switch, manually operated device, display or LED is greater than sixty (60) inches above the finished floor.
- C. The remote annunciator shall be flush mounted so that no switch, manually operated device, display, or LED is greater than sixty (60) inches above the finished floor. The remote annunciator shall be located at the entrance designated for responding personnel or as otherwise acceptable to the AHJ.
- D. The documentation cabinet shall be surface mounted adjacent to the fire alarm control panel, or as otherwise acceptable to the AHJ.
- E. Smoke detectors shall be mounted on the underside of the ceiling or deck. Locate detectors more than three (3) feet from air supply diffusers or return air openings. The smoke detector and fire alarm cabling shall be installed and supported a minimum 1-½ inches from the lowest surface of the roof decking in accordance with National Electrical Code.
- F. Smoke and duct detectors shall not be installed until after the construction clean-up of all trades is complete and final. Detectors that have been installed prior to final clean-up by all trades shall be cleaned or replaced in accordance with NFPA 72.
- G. Duct detectors shall be mounted in the air duct of HVAC units. Duct detectors shall be mounted in such a way as to obtain a representative sample of the airstream. Detectors shall be accessible for cleaning and shall be mounted in accordance with the manufacturer's instructions and NFPA standards. Coordinate placement and connect all circuits.
- H. Remote test stations, where required, shall be mounted in proximity of the associated device or unit, at an accessible location that does not conflict with store fixtures, where visible in normally occupied areas and acceptable to the AHJ.
- I. All HVAC equipment shutdown shall be initiated by relays integral to the addressable control relays. Relays shall be mounted within three (3) feet of the motor controller or control circuit of the affected equipment. Provide cabling and wiring connections to HVAC shutdown controls. Final terminations to HVAC shutdown controls are by mechanical or controls contractor. Provide any required intermediate relays for connections to HVAC shutdown controls.
- J. Manual pull stations shall be securely mounted with the operable part of the manual pull station no greater than forty-eight (48) inches above the finished floor and no less than forty-two (42) inches above the finished floor. Where possible, provide flush mounted on standard electrical boxes.
- K. Wall mounted audible/visual and visual appliances shall be mounted such that the entire lens is not less than eighty (80) inches and not greater than ninety-six (96) inches above the finished floor or at the mounting height specified using the performance-based alternative. Provide flush mounting of appliances (if possible). Where surface mounting is necessary, provide a decorative backbox skirt covering the appliance backbox.

- L. Ceiling mounted audible/visual appliance shall be mounted with their visual lenses having an unobstructed line of site in all directions. Exact locations of appliances shall be sufficiently distant from vertical surfaces and hanging items to permit maximum viewing from all directions. Provide flush mounting of appliances (if possible). Where surface mounting is necessary, provide a decorative backbox skirt covering the appliance backbox.
- M. Weatherproof exterior notification appliances shall be flush mounted at the fire department connection on the building exterior and with the final location as acceptable to the AHJ.
- N. Devices and appliances shall be installed in the center or quarter point of the ceiling tiles. Devices and appliances shall not be supported by ceiling tiles. Devices and appliances must be attached to backbox supported by the ceiling grid.
- O. All initiating devices and addressable modules shall be mounted in a location accessible for testing and maintenance.

### 3.4 RESTORATION OF SITE

- A. Where sidewalks, curbs, and lawns are excavated by the Fire Alarm Contractor, these areas shall be backfilled and replaced to the original condition and to the satisfaction of the Owner, Architect and AHJ.

### 3.5 PAINTING AND PATCHING

- A. All fire alarm conduit shall be thoroughly cleaned, removing all dirt, oil, etc. and made ready to receive paint.
- B. Holes in walls or floors cut during the performance of this work shall be patched or covered with standard escutcheon plates so as to completely conceal the cuts where they would otherwise be exposed to view.
- C. Holes in walls and ceilings created by the removal of fire alarm equipment no longer used shall be patched and painted to match the existing walls and ceilings, or covered with standard escutcheon plates so as to completely conceal the "holes" where they would otherwise be exposed to view.
- D. All penetrations of fire rated assemblies (wall or floor construction) shall be firestopped to preserve the original fire resistance and smoketight integrity of the assembly. All firestopping methods shall be UL listed Through Penetration Firestop Systems or otherwise approved by the Owner, Architect, Engineer, and AHJ. Specific firestop assembly shall be identified at the penetration location with a sticker or other approved identification means.

### 3.6 SYSTEM TESTS

- A. All test and inspections specified in this section shall be reported in writing and submitted in accordance with this specification section.
- B. The system shall meet all the requirements of the listed applicable codes and the requirements of the AHJ. The system tests and test documents, including those required for and by the approved remote monitoring station, shall meet the requirements of the AHJ.
- C. Provide one hundred (100) percent initial acceptance testing of the entire fire alarm system prior to the required AHJ acceptance testing. Before requesting the AHJ acceptance testing, furnish a written statement to the Owner's Representative indicating that the system has been installed in accordance with the approved documents and tested in

accordance with the manufacturer's specifications and the applicable NFPA requirements. The Record of Completion shall be completed and submitted as part of the written statement.

- D. All testing, inspection and retesting required for certification and required for all warranty work or replacements shall meet the requirements of the AHJ. This certification, inspection, or testing shall be completed at no additional cost to the Owner.
- E. Provide the testing date in writing to the Owner a minimum of two (2) weeks before the date. The Owner may elect to have a representative present for testing.
- F. The fire alarm system will not be acceptable until final testing and receipt of the testing certificates have been obtained.
- G. Reacceptance Testing shall be performed to verify the proper operation of added or replaced devices and appliances.
- H. Fire alarm system will be considered defective if it does not pass tests and inspections.

### 3.7 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain fire alarm system.

END OF SECTION 28 31 11

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 283133 – FIRE ALARM AND MONITORING SYSTEM

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Project Number: \_\_\_\_\_ Store Number: \_\_\_\_\_

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the sprinkler supervisory, fire alarm and monitoring system is installed and is in general conformance with the Contract Documents, applicable Codes, and shop drawings. The sprinkler supervisory, fire alarm and monitoring system has been provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents. To be accepted, all signatures must be original ink signatures (copies are not allowed).

SPRINKLER SUPERVISORY, FIRE ALARM AND MONITORING SYSTEM INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

FIRE ALARM CONDUIT INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address)

Phone Number: (    ) \_\_\_\_\_

GENERAL CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address)

Phone Number: (    ) \_\_\_\_\_

## SECTION 323129 - WOOD FENCES AND GATES

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section Includes: Wood screen fence and gates.

## PART 2 - PRODUCTS

## 2.1 WOOD MATERIALS

- A. Wood Materials:
1. Pickets: Pressure Treated; #1 Grade.
    - a. 1 x 6-inch pickets.
    - b. 1 x 6-inch top trim.
    - c. 2 x 10-inch cap.
    - d. 2 x 6 stringers.
- B. Steel Posts:
1. 4 x 4 and 6 x 6 galvanized tube steel.
  2. Galvanized steel, weather tight closure cap for each post.
- C. Finish: Exterior water-borne (alkyd vehicle) toner giving UV, water repellant, and mildew protection, enhancing natural wood grain and texture with a natural amber tone.
1. Woodscapes, by Sherwin-Williams.
  2. Color: As indicated on Drawings.
  3. Substitutions not allowed.

## 2.2 ACCESSORIES

- A. Fasteners: Hot-dipped galvanized nails, screws, and bolts.
- B. Hardware: US1D, Black Finish.
1. Heavy Duty Barrel Hinge: #SKU213000.
  2. Latch: Stanley CD1264.
- A. Rolling Gate Hardware:
1. Swing Gate Roller: Model 017833 with 6-inch wheel, by Hearne Steel Company (979) 279-3464.
  2. Substitutions: Similar product by other Manufacturers.

## PART 3 - EXECUTION

## 3.1 PREPARATION

- A. Prepare 16-inch diameter post hole excavation, minimum 3 feet deep or as shown on the drawings.
- B. Set fence posts in concrete, centered and plumb.

## 3.2 INSTALLATION

- A. Construct fence as indicated on Drawings.
1. Secure wood rails to galvanized steel posts with galvanized bolts.
  2. Secure wood pickets to wood rails with galvanized screws.
- B. Latch: On outside face of gates, at 48" above finish grade.

- C. Hinges:
  - 1. Top and Bottom of Gate: One at each location.
  - 2. Intermediate: 30 inches o.c., maximum, from any other hinge.
- D. Cane Bolt: On inside face of gate leaf that has the strike portion of latch on the outside face.
- E. Swing Gate Roller: Install per Manufacturer's written instructions.
- F. Finish: Prepare surfaces and apply finish per Manufacturer's directions/recommendations. Ensure complete, uniform coverage of all surfaces. Apply two coats minimum. Apply second coat within two hours of first coat, per Manufacturer's directions.

END OF SECTION 323129

CONTRACTOR'S RECORD LETTER OF CONFORMANCE  
SECTION 323129 – WOOD FENCES AND GATES

Project Location: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
(City & State)

Statement of Conformance:

This Record Letter of Conformance is provided as a Record Document in accordance with Section 017700 – Closeout Procedures. The undersigned hereby declares that the wood fences and gates are installed and are in general conformance with the Contract Documents, applicable Codes, and shop drawings. The wood fences and gates have been provided and placed in operational condition in accordance with the Manufacturer's published instructions and the Contract Documents.

To be accepted, all signatures must be original ink signatures (copies are not allowed).

WOOD FENCE AND GATE INSTALLER:

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

\_\_\_\_\_  
(Subcontractor name and address) Phone Number: (    ) \_\_\_\_\_

CONTRACTOR:

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

\_\_\_\_\_  
(Contractor name and address) Phone Number: (    ) \_\_\_\_\_

