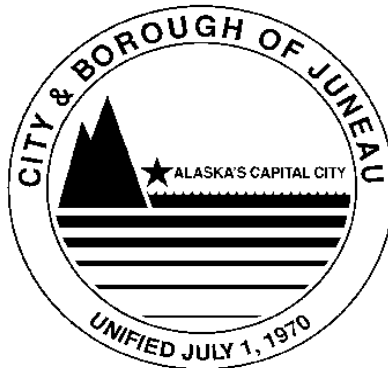


# **BARTLETT REGIONAL HOSPITAL (BRH) MEDICAL SURGICAL EAST WING RENOVATION**

**VOLUME II OF III  
Divisions 9 through 28**

**Contract No. E10-221**

File No. 1648



ENGINEERING DEPARTMENT

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**END OF SECTION**

## **SECTION 092216 - NON-STRUCTURAL METAL FRAMING**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section Includes:

- 1. Non-load-bearing steel framing systems for interior gypsum board assemblies.
  - 2. Suspension systems for interior gypsum ceilings, soffits, and grid systems.

- B. Related Requirements:

- 1. Division 05 Section "Cold-Formed Metal Framing" for exterior and interior load-bearing and exterior non-load-bearing wall studs; floor joists; roof rafters and ceiling joists; and roof trusses.

#### **1.3 ACTION SUBMITTALS**

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

### **PART 2 - PRODUCTS**

#### **2.1 PERFORMANCE REQUIREMENTS**

- A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

#### **2.2 FRAMING SYSTEMS**

- A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
  - 1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
  - 2. Protective Coating: ASTM A 653/A 653M, G60, hot-dip galvanized unless otherwise indicated.

## **SECTION 092216 - NON-STRUCTURAL METAL FRAMING**

- B. Studs and Runners: ASTM C 645. Use either steel studs and runners.
  - 1. Steel Studs and Runners:
    - a. Minimum Base-Metal Thickness: 0.027 inch to 12' unsupported length and 0.033 inch over 12'.
    - b. Depth: As indicated on Drawings.
- C. Slip-Type Head Joints: Where indicated, provide the following:
  - 1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch- deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.
- D. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
  - 1. Minimum Base-Metal Thickness: As indicated on drawings.
- E. Cold-Rolled Channel Bridging: Steel, 0.053-inch minimum base-metal thickness, with minimum 1/2-inch- wide flanges.
  - 1. Depth: 1-1/2 inches.
  - 2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch- thick, galvanized steel.
- F. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
  - 1. Minimum Base-Metal Thickness: 0.033 inch.
  - 2. Depth: 7/8 inch.
- G. Resilient Furring Channels: 1/2-inch- deep, steel sheet members designed to reduce sound transmission.
  - 1. Configuration: Asymmetrical.
- H. Cold-Rolled Furring Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch- wide flanges.
  - 1. Depth: 3/4 inch.
  - 2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum uncoated-steel thickness of 0.033 inch.
  - 3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- diameter wire, or double strand of 0.048-inch- diameter wire.
- I. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, minimum uncoated-metal thickness of 0.018 inch, and depth required to fit insulation thickness indicated.

## SECTION 092216 - NON-STRUCTURAL METAL FRAMING

### 2.3 SUSPENSION SYSTEMS

- A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- diameter wire, or double strand of 0.048-inch- diameter wire.
- B. Hanger Attachments to Concrete:
  - 1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by an independent testing agency.
    - a. Type: Postinstalled, chemical anchor.
  - 2. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E 1190 by an independent testing agency.
- C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.125 inch in diameter.
- D. Flat Hangers: Steel sheet, 1 by 3/16 inch by length indicated.
- E. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.053 inch and minimum 1/2-inch- wide flanges.
  - 1. Depth: 1-1/2 inches.
- F. Furring Channels (Furring Members):
  - 1. Cold-Rolled Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges, 3/4 inch deep.
  - 2. Steel Studs and Runners: ASTM C 645.
    - a. Minimum Base-Metal Thickness: 0.033 inch.
    - b. Depth: 2-1/2 inches.
  - 3. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.
    - a. Minimum Base-Metal Thickness: 0.033 inch.
  - 4. Resilient Furring Channels: 1/2-inch- deep members designed to reduce sound transmission.
    - a. Configuration: Asymmetrical.
- G. Grid Suspension System for Gypsum Board Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.

## **SECTION 092216 - NON-STRUCTURAL METAL FRAMING**

1. Products: Subject to compliance with requirements, provide one of the following:
  - a. Armstrong World Industries, Inc.; Drywall Grid Systems.
  - b. Chicago Metallic Corporation; Drywall Grid System.
  - c. USG Corporation; Drywall Suspension System.

### **2.4 AUXILIARY MATERIALS**

- A. General: Provide auxiliary materials that comply with referenced installation standards.
  1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. Isolation Strip at Exterior Walls: Provide the following:
  1. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 PREPARATION**

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the WORK and that hangers will develop their full strength.
  1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.
- B. Coordination with Sprayed Fire-Resistive Materials:
  1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed fire-resistive materials and as indicated on drawings. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 16 inches o.c.
  2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-

## **SECTION 092216 - NON-STRUCTURAL METAL FRAMING**

resistive materials below that required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

### **3.3 INSTALLATION, GENERAL**

- A. Installation Standard: ASTM C 754.
  - 1. Gypsum Plaster Assemblies: Also comply with requirements in ASTM C 841 that apply to framing installation.
  - 2. Portland Cement Plaster Assemblies: Also comply with requirements in ASTM C 1063 that apply to framing installation.
  - 3. Gypsum Veneer Plaster Assemblies: Also comply with requirements in ASTM C 844 that apply to framing installation.
  - 4. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- C. Install bracing at terminations in assemblies.
- D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

### **3.4 INSTALLING FRAMED ASSEMBLIES**

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
  - 1. Single-Layer Application: 16 inches o.c. unless otherwise indicated.
  - 2. Multilayer Application: 16 inches o.c. unless otherwise indicated.
  - 3. Tile Backing Panels: 16 inches o.c. unless otherwise indicated.
- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- C. Install studs so flanges within framing system point in same direction.
- D. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.
  - 1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
  - 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.

## SECTION 092216 - NON-STRUCTURAL METAL FRAMING

- a. Install two studs at each jamb unless otherwise indicated.
  - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
  - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
  4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
  5. Indicate locations and details of firestop track on Drawings.
  6. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
  7. Curved Partitions:
    - a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
    - b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of no fewer than two studs at ends of arcs, place studs 6 inches o.c.
- E. Direct Furring:
1. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
- F. Z-Furring Members:
1. Erect insulation, specified in Division 07 Section "Thermal Insulation," vertically and hold in place with Z-furring members spaced 24 inches o.c.
  2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
  3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.
- G. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

### 3.5 INSTALLING SUSPENSION SYSTEMS

- A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
1. Hangers: 48 inches o.c.

## **SECTION 092216 - NON-STRUCTURAL METAL FRAMING**

2. Carrying Channels (Main Runners): 48 inches o.c.
  3. Furring Channels (Furring Members): 16 inches o.c.
- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- C. Suspend hangers from building structure as follows:
1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
    - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
  2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
    - a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
  3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
  4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
  5. Do not attach hangers to steel roof deck.
  6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
  7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
  8. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
- E. Seismic Bracing: Sway-brace suspension systems with hangers used for support as indicated on drawings.
- F. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.
- G. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

**END OF SECTION 092216**



## **SECTION 092900 - GYPSUM BOARD**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section Includes:

- 1. Interior gypsum board.
  - 2. Tile backing panels.

- B. Related Requirements:

- 1. Division 07 Section "Intumescent Mastic Fireproofing" for head of wall.
  - 2. Division 07 Section "Joint Sealants" for misc trim.
  - 3. Division 09 Section "Non-Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board panels.
  - 4. Division 09 Section "Tiling" for cementitious backer units installed as substrates for ceramic tile.

#### **1.3 ACTION SUBMITTALS**

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

- B. Samples: For the following products:

- 1. Gypsum and Cementitious Boards: Full size 12-inch x 12-inch samples for each product indicated.
  - 2. Trim Accessories: Full-size Sample in 12-inch- long length for each trim accessory indicated.

#### **1.4 QUALITY ASSURANCE**

- A. Mockups: Before beginning gypsum board installation, install mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and set quality standards for materials and execution.

- 1. Install mockups for the following:
    - a. Each level of gypsum board finish indicated for use in exposed locations.
    - b. Exterior Wall assemblies.
    - c. Toilet/Shower Wall assemblies.

## **SECTION 092900 - GYPSUM BOARD**

2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
3. Simulate finished lighting conditions for review of mockups.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

### **1.5 DELIVERY, STORAGE AND HANDLING**

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

### **1.6 FIELD CONDITIONS**

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- 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.
  1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
  2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

## **PART 2 - PRODUCTS**

### **2.1 PERFORMANCE REQUIREMENTS**

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.
- C. Low Emitting Materials: For ceiling and wall assemblies, provide materials and construction identical to those tested in assembly and complying 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."

## **SECTION 092900 - GYPSUM BOARD**

### **2.2 GYPSUM BOARD, GENERAL**

- A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

### **2.3 INTERIOR GYPSUM BOARD**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- 1. American Gypsum.
- 2. Georgia-Pacific Gypsum LLC.
- 3. National Gypsum Company.
- 4. USG Corporation.

- B. Gypsum Board, Type X: ASTM C 1396/C 1396M.

- 1. Thickness: 5/8 inch UON on drawings
- 2. Long Edges: Tapered Rounded edge.

- C. Gypsum Ceiling Board, Type X: ASTM C 1396/C 1396M.

- 1. Thickness: 5/8 inch.
- 2. Long Edges: Tapered.

- D. Moisture- and Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.

- 1. Core: As indicated Type X.
- 2. Long Edges: Tapered.
- 3. Mold Resistance: ASTM D 3273, score of 10.

- E. Acoustically Enhanced Gypsum Board: ASTM C 1396/C 1396M. Multilayer products constructed of two layers of gypsum boards sandwiching a viscoelastic sound-absorbing polymer core.

- 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. National Gypsum Company; Sound Break.
  - b. Quiet Solution, Quiet Rock.
- 2. Core: As indicated Type X.
- 3. Long Edges: Tapered.

### **2.4 TILE BACKING PANELS**

- A. Cementitious Backer Units: ANSI A118.9 and ASTM C 1288 or 1325, with manufacturer's standard edges.

## **SECTION 092900 - GYPSUM BOARD**

1. Products: Subject to compliance with requirements, [provide the following] [provide one of the following] [available products that may be incorporated into the Work include, but are not limited to, the following]:
    - a. CertainTeed Corp.; FiberCement BackerBoard.
    - b. Custom Building Products; Wonderboard.
    - c. National Gypsum Company, Permabase Cement Board.
    - d. USG Corporation; DUROCK Cement Board.
  2. Thickness: As indicated.
  3. Mold Resistance: ASTM D 3273, score of 10.
- B. Water-Resistant Gypsum Backing Board: ASTM C 1396/C 1396M, with manufacturer's standard edges.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. American Gypsum.
    - b. Georgia-Pacific Gypsum LLC.
    - c. National Gypsum Company.
    - d. USG Corporation.
  2. Core: As indicated on Drawings Type X.

### **2.5 TRIM ACCESSORIES**

- A. Interior Trim: ASTM C 1047.
1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc or Plastic.
  2. Shapes:
    - a. Cornerbead.
    - b. Bullnose bead.
    - c. LC-Bead: J-shaped; exposed long flange receives joint compound.
    - d. L-Bead: L-shaped; exposed long flange receives joint compound.
    - e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
    - f. Expansion (control) joint.
- B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Fry Reglet Corp.
    - b. Gordon, Inc.
    - c. Pittcon Industries.
  2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221, Alloy 6063-T5.

## SECTION 092900 - GYPSUM BOARD

3. Finish: Clear; AAMA 611, Class II, 0.010 mm or thicker.

### 2.6 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
  1. Interior Gypsum Board: Paper.
  2. Tile Backing Panels: As recommended by panel manufacturer.
- C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
  1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
  2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
    - a. Use setting-type compound for installing paper-faced metal trim accessories.
  3. Fill Coat: For second coat, use setting-type, sandable topping compound.
  4. Finish Coat: For third coat, use setting-type, sandable topping compound.
  5. Skim Coat: For final coat of Level 5 finish, use high build interior coating product designed for application by airless sprayer and to be used instead of skim coat to produce Level 5 finish.
- D. Joint Compound for Tile Backing Panels:
  1. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.
  2. Cementitious Backer Units: As recommended by backer unit manufacturer.
  3. Water-Resistant Gypsum Backing Board: Use setting-type taping compound and setting-type, sandable topping compound.

### 2.7 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
  1. Laminating adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  2. Laminating 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. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

## **SECTION 092900 - GYPSUM BOARD**

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
  2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- D. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
- E. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Accumetric LLC; BOSS 824 Acoustical Sound Sealant.
    - b. Grabber Construction Products; Acoustical Sealant GSC.
    - c. Pecora Corporation; AC-20 FTR.
    - d. Specified Technologies, Inc.; Smoke N Sound Acoustical Sealant.
    - e. USG Corporation; SHEETROCK Acoustical Sealant.
  2. Acoustical joint sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  3. Acoustical joint sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- F. Thermal Insulation: As specified in Division 07 Section "Thermal Insulation."
- G. Vapor Retarder: As specified in Division 07 Section "Thermal Insulation."

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

## **SECTION 092900 - GYPSUM BOARD**

### **3.2 APPLYING AND FINISHING PANELS, GENERAL**

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc., except in chases braced internally).
  - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
  - 2. Fit gypsum panels around ducts, pipes, and conduits.
  - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members or provide control joints to counteract wood shrinkage.
- J. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- K. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

## **SECTION 092900 - GYPSUM BOARD**

### **3.3 APPLYING INTERIOR GYPSUM BOARD**

- A. Install interior gypsum board in the following locations:
  - 1. Type X: Vertical surfaces unless otherwise indicated.
  - 2. Ceiling Type: Ceiling surfaces.
  - 3. Moisture- and Mold-Resistant Type: At wet locations but not limited to; Toilet Rooms, Sink.
  - 4. Acoustically Enhanced Type: As indicated on Drawings.
- B. Single-Layer Application:
  - 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
  - 2. On partitions/walls, apply gypsum panels vertical (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
    - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
    - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
  - 3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
  - 4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.
- C. Multilayer Application:
  - 1. On ceilings, apply gypsum board indicated for base layers before applying face layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
  - 2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
  - 3. On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
  - 4. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

### **3.4 APPLYING TILE BACKING PANELS**

- A. Cementitious Backer Units: ANSI A108.11, locations indicated to receive tile.



## **SECTION 092900 - GYPSUM BOARD**

- B. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

### **3.5 INSTALLING TRIM ACCESSORIES**

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:
  - 1. Cornerbead: Use at outside corners, unless otherwise indicated.
  - 2. Bullnose Bead: where indicated.
  - 3. LC-Bead: Use at exposed panel edges.
  - 4. L-Bead: Use where indicated.
  - 5. U-Bead: Use [at exposed panel edges] [where indicated] <Insert requirements>.
  - 6. Curved-Edge Cornerbead: Use at curved openings.
- D. Aluminum Trim: Install in locations indicated on Drawings.

### **3.6 FINISHING GYPSUM BOARD**

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
  - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
  - 2. Level 2: Panels that are substrate for tile.
  - 3. Level 3: Panel that at substrate for wall coverings.
  - 4. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
    - a. Primer and its application to surfaces are specified in other Division 09 Sections.
  - 5. Level 5: Where indicated on Drawings.
    - a. Primer and its application to surfaces are specified in other Division 09 Sections.
- E. Glass-Mat Gypsum Sheathing Board: Finish according to manufacturer's written instructions for use as exposed soffit board.

## **SECTION 092900 - GYPSUM BOARD**

- F. Glass-Mat Faced Panels: Finish according to manufacturer's written instructions.
- G. Cementitious Backer Units: Finish according to manufacturer's written instructions.

### **3.7 APPLYING TEXTURE FINISHES**

- A. Surface Preparation and Primer: Prepare and apply primer to gypsum panels and other surfaces receiving texture finishes. Apply primer to surfaces that are clean, dry, and smooth.

### **3.8 PROTECTION**

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
  - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
  - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

**END OF SECTION 092900**

## **SECTION 093000 - TILING**

### **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. Ceramic tile.
  - 2. Stone thresholds.
  - 3. Waterproof membrane.
  - 4. Crack isolation membrane.
  - 5. Tile backing panels.

- B. Related Requirements:

- 1. Division 03 Section "Floor Substrate Preparation" for installation of finishes over.

#### **1.3 DEFINITIONS**

- A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.
- B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in "American National Standard Specifications for Installation of Ceramic Tile."
- C. Module Size: Actual tile size plus joint width indicated.
- D. Face Size: Actual tile size, excluding spacer lugs.

#### **1.4 PERFORMANCE REQUIREMENTS**

- A. Static Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ASTM C 1028.

#### **1.5 SUBMITTALS**

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

## **SECTION 093000 - TILING**

- B. Samples for Initial Selection: For each type of tile and grout indicated. Include Samples of accessories involving color selection.
- C. Product Certificates: For each type of product, signed by product manufacturer.
- D. Material Test Reports: For each tile-setting and -grouting product.

### **1.6 QUALITY ASSURANCE**

- A. Source Limitations for Tile: Obtain tile of each type and color or finish from one source or producer.
- B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from one manufacturer and each aggregate from one source or producer.
- C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer for each product:
  - 1. Waterproof membrane.
  - 2. Crack isolation membrane.
  - 3. Joint sealants.
  - 4. Cementitious backer units.
- D. Preinstallation Conference: Conduct conference at Project site.
  - 1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

### **1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.
- D. Store liquid materials in unopened containers and protected from freezing.
- E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

### **1.8 PROJECT CONDITIONS**

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

## **SECTION 093000 - TILING**

### **1.9 EXTRA MATERIALS**

- A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.
  - 2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

## **PART 2 - PRODUCTS**

### **2.1 PRODUCTS, GENERAL**

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
  - 1. Provide tile complying with Standard grade requirements unless otherwise indicated.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCA installation methods specified in tile installation schedules, and other requirements specified.
- C. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.
  - 1. Where tile is indicated for installation in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.
- D. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating with continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

### **2.2 TILE PRODUCTS**

- A. Tile Type - CMT: Factory-mounted unglazed ceramic mosaic tile.
  - 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 Olean; Division of Dal-Tile International Inc.
    - b. Crossville, Inc.
    - c. Daltile; Division of Dal-Tile International Inc.
    - d. Interceramic.

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2. Composition: Porcelain.
3. Module Size: 2 by 2 inches.
4. Thickness: 1/4 inch.
5. Face: Plain with cushion edges.
6. Surface: Smooth, without abrasive admixture.
7. Tile Color and Pattern: As selected by ARCHITECT from manufacturer's full range.
8. Grout Color: As selected by ARCHITECT from manufacturer's full range.
9. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:
  - a. External Corners for Thin-Set Mortar Installations: Surface bullnose, module size 2 by 2 inches.
  - b. Internal Corners: Field-butt square corners. For coved base and cap, use angle pieces designed to fit with stretcher shapes.
  - c. Tapered Transition Tile: Shape designed to effect transition between thickness of tile floor and adjoining floor finishes of different thickness, tapered to provide reduction in thickness from 1/2 to 1/4 inch across nominal 4-inch dimension.

### B. Tile Type CT: Glazed wall tile.

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 Marazzi Tile, Inc.
  - b. American Olean; Division of Dal-Tile International Inc.
  - c. Daltile; Division of Dal-Tile International Inc.
  - d. Florida Tile Industries, Inc.
  - e. Portobello America, Inc.
  - f. Seneca Tiles, Inc.
  - g. United States Ceramic Tile Company.
2. Module Size: 4-1/4 by 4-1/4 inches.
3. Thickness: 5/16 inch.
4. Face: Plain with modified square edges or cushion edges.
5. Finish: Bright.
6. Tile Color and Pattern: As selected by ARCHITECT from manufacturer's full range.
7. Grout Color: As selected by ARCHITECT from manufacturer's full range.
8. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable. Provide shapes as follows, selected from manufacturer's standard shapes:
  - a. Base for Thin-Set Mortar Installations: Straight, module size 4-1/4 by 4-1/4 inches.
  - b. Wainscot Cap for Thin-Set Mortar Installations: Surface bullnose, module size 4-1/4 by 4-1/4 inches.
  - c. External Corners for Thin-Set Mortar Installations: Surface bullnose, same size as adjoining flat tile.
  - d. Internal Corners: Field-butt square corners. For coved base and cap use angle pieces designed to fit with stretcher shapes.

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### 2.3 THRESHOLDS

- A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.
  - 1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch or less above adjacent floor surface.
- B. Marble Thresholds: ASTM C 503, with a minimum abrasion resistance of 10 per ASTM C 1353 or ASTM C 241 and with honed finish.
  - 1. Description: Uniform, fine- to medium-grained white stone with gray veining.

### 2.4 TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A118.9 or ASTM C 1325, in maximum lengths available to minimize end-to-end butt joints.
  - 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. C-Cure; C-Cure Board 990.
    - b. Custom Building Products; Wonderboard.
    - c. FinPan, Inc.; Util-A-Crete Concrete Backer Board.
    - d. USG Corporation; DUROCK Cement Board.
  - 2. Thickness: As indicated.

### 2.5 WATERPROOF MEMBRANE

- A. General: Manufacturer's standard product that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Fluid-Applied Membrane: Liquid-latex rubber or elastomeric polymer.
  - 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. Boiardi Products; a QEP company; Elastiment 644 Membrane Waterproofing System.
    - b. Bonsal American; an Oldcastle company; B 6000 Waterproof Membrane.
    - c. Bostik, Inc.; Durabond D-222 Duraguard Membrane or Hydroment Gold.
    - d. C-Cure; Pro-Red Waterproofing Membrane 63.
    - e. Custom Building Products; Redgard Waterproofing and Crack Prevention Membrane.
    - f. Jamo Inc.; Waterproof.
    - g. Laticrete International, Inc.; Laticrete Watertight Floor N' Wall Waterproofing.

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- h. MAPEI Corporation; Mapelastic HPG.
- i. Southern Grouts & Mortars, Inc.; Southcrete 1100 Crack Suppression and Waterproofing.
- j. TEC; a subsidiary of H. B. Fuller Company; HydraFlex - Waterproofing Crack Isolation Membrane.

### **2.6 CRACK ISOLATION MEMBRANE**

- A. General: Manufacturer's standard product that complies with ANSI A118.12 for standard performance and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Fluid-Applied Membrane: Liquid-latex rubber or elastomeric polymer.
  - 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. Bostik, Inc.; Durabond D-222 Duraguard Membrane or Hydroment Gold.
    - b. C-Cure; CureLastic 949.
    - c. Custom Building Products; Redgard Waterproofing and Crack Prevention Membrane.
    - d. Jamo Inc.; Waterproof.
    - e. Mer-Kote Products, Inc.; Fracture-Guard 5000.
    - f. Southern Grouts & Mortars, Inc.; Southcrete 1100 Crack Suppression and Waterproofing.
    - g. TEC; a subsidiary of H. B. Fuller Company; HydraFlex - Waterproofing Crack Isolation Membrane.

### **2.7 SETTING MATERIALS**

- A. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Boiardi Products; a QEP company.
    - b. Bonsal American; an Oldcastle company.
    - c. Bostik, Inc.
    - d. C-Cure.
    - e. Custom Building Products.
    - f. Laticrete International, Inc.
    - g. MAPEI Corporation.
    - h. Summitville Tiles, Inc.
    - i. TEC; a subsidiary of H. B. Fuller Company.
  - 2. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.



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3. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.

### 2.8 GROUT MATERIALS

#### A. Water-Cleanable Epoxy Grout: ANSI A118.3.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the WORK include, but are not limited to, the following:
  - a. Atlas Minerals & Chemicals, Inc.
  - b. Boiardi Products; a QEP company.
  - c. Bonsal American; an Oldcastle company.
  - d. Bostik, Inc.
  - e. C-Cure.
  - f. Custom Building Products.
  - g. Jamo Inc.
  - h. Laticrete International, Inc.
  - i. MAPEI Corporation.
  - j. Mer-Kote Products, Inc.
  - k. Summitville Tiles, Inc.
  - l. TEC; a subsidiary of H. B. Fuller Company.
2. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 deg F and 212 deg F, respectively, and certified by manufacturer for intended use.

### 2.9 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- B. Temporary Protective Coating: Product that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with tile, mortar, and grout products; and easily removable after grouting is completed without damaging grout or tile.
- C. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.
- D. Grout Sealer: Manufacturer's standard product for sealing grout joints and that does not change color or appearance of grout.
  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. Bonsal American; an Oldcastle company; Grout Sealer.

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- b. Bostik, Inc.; CeramaSeal Grout & Tile Sealer.
- c. C-Cure; Penetrating Sealer 978.
- d. Custom Building Products; Surfaceguard Sealer.
- e. Jamo Inc.; Matte Finish Sealer.
- f. MAPEI Corporation; KER .
- g. Summitville Tiles, Inc.; SL-15, Invisible Seal Penetrating Grout and Tile Sealer.
- h. TEC; a subsidiary of H. B. Fuller Company; Grout Sealer.

### **2.10 MIXING MORTARS AND GROUT**

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
  - 1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
  - 2. Verify that concrete substrates for tile floors installed with thin-set mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
    - a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
    - b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
  - 3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
  - 4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with ARCHITECT.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

## **SECTION 093000 - TILING**

### **3.2 PREPARATION**

- A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot toward drains.
- C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.
- D. Field-Applied Temporary Protective Coating: If indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

### **3.3 TILE INSTALLATION**

- A. Comply with TCA's "Handbook for Ceramic Tile Installation" for TCA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
  - 1. For the following installations, follow procedures in the ANSI A108 Series of tile installation standards for providing 95 percent mortar coverage:
    - a. Tile floors in wet areas.
- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- D. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
  - 1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
  - 2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
  - 3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.

## **SECTION 093000 - TILING**

- E. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
  - 1. Ceramic Mosaic Tile: 1/16 inch.
  - 2. Glazed Wall Tile: 1/16 inch.
- F. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- G. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
  - 1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
  - 2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."
- H. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.
  - 1. Do not extend waterproofing or crack isolation membrane under thresholds set in latex-portland cement mortar. Fill joints between such thresholds and adjoining tile set on waterproofing or crack isolation membrane with elastomeric sealant.
- I. Grout Sealer: Apply grout sealer to cementitious grout joints in tile floors according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

### **3.4 TILE BACKING PANEL INSTALLATION**

- A. Install cementitious backer units and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated.

### **3.5 WATERPROOFING INSTALLATION**

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

### **3.6 CRACK ISOLATION MEMBRANE INSTALLATION**

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

## **SECTION 093000 - TILING**

### **3.7 CLEANING AND PROTECTING**

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

**END OF SECTION 093000**

## **SECTION 095113 - ACOUSTICAL PANEL CEILINGS**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section includes acoustical panels and exposed suspension systems for ceilings.
- B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.

#### **1.3 ACTION SUBMITTALS**

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

#### **1.4 INFORMATIONAL SUBMITTALS**

- A. Product Test Reports: For each acoustical panel ceiling, for tests performed by manufacturer and witnessed by a qualified testing agency.
- B. Evaluation Reports: For each acoustical panel ceiling suspension system, from ICC-ES.

#### **1.5 CLOSEOUT SUBMITTALS**

- A. Maintenance Data: For finishes to include in maintenance manuals.

#### **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver acoustical panels, suspension-system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

## **SECTION 095113 - ACOUSTICAL PANEL CEILINGS**

### **1.7 FIELD CONDITIONS**

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
  - 1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

## **PART 2 - PRODUCTS**

### **2.1 PERFORMANCE REQUIREMENTS**

- A. Seismic Performance: Acoustical ceiling shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Flame-Spread Index: Comply with ASTM E 1264 for Class A materials.
  - 2. Smoke-Developed Index: 50 or less.
- C. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

### **2.2 ACOUSTICAL PANELS, GENERAL**

- A. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system from single source from single manufacturer.
- B. Glass-Fiber-Based Panels: Made with binder containing no urea formaldehyde.
- C. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances unless otherwise indicated.
- D. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.

### **2.3 ACOUSTICAL PANELS – ACP:**

- A. Basis-of-Design Product: Subject to compliance with requirements, provide the following or approved equal:
  - 1. MFR: Armstrong World Industries, Inc.

- a. ACP1: #1761 Fine Fissured Second Look

## **SECTION 095113 - ACOUSTICAL PANEL CEILINGS**

- 1) Size: 2'x4'x3/4"
  - 2) Edge Profile: 15/16" Square Lay-In
  - 3) Material: Wet-formed mineral fiber
  - 4) NRC: .55
  - 5) Fire Rating: Class A
  - 6) ASTM E1264 Classification: Type III, Form 2
  - 7) Grid System: Prelude XL
- b. ACP2: #868 Clean Room VL
- 1) Size: 2'x2'x5/8"
  - 2) Edge Profile: 15/16" Square Lay-in
  - 3) Material: Wet-formed fiber with vinyl-faced membrane
  - 4) CAC: 40
  - 5) Fire Rating: Fire Guard
  - 6) ASTM E1264 Classification: Type IV, Form 2, Pattern E
  - 7) Grid System: Prelude, Clean Room
- c. ACP3: #1729 Fine Fissured Medium Texture
- 1) Size: 2'x4'x5/8"
  - 2) Edge Profile: 15/16" Square Lay-in
  - 3) Material: Wet-formed mineral fiber
  - 4) NRC: .55
  - 5) Fire Rating: Class A
  - 6) ASTM E1264 Classification: Type III, Form 2
  - 7) Grid System: Prelude XL
- d. ACP4: #1732 Fine Fissured Tegular
- 1) Size: 2'x2'x5/8"
  - 2) Edge Profile: 15/16" Angled Tegular
  - 3) Material: Wet-formed mineral fiber
  - 4) NRC: .55
  - 5) Fire Rating: Class A
  - 6) ASTM E1264 Classification: Type III, Form 2
  - 7) Grid System: Prelude XL
- e. ACP5: Cirrus Themes Plain and Leaves Panel
- 1) Size: 2'x2'
  - 2) Thickness: Match existing (3/4" - Verify)
  - 3) Edge Profile: Match existing (15/16" Angled Tegular - Verify)
  - 4) Material: Wet-formed mineral fiber
  - 5) NRC: .55
  - 6) Fire Rating: Class A
  - 7) ASTM E1264 Classification: Type III, Form 1
  - 8) Grid System: Prelude XL or match existing

B. Color: White.



## SECTION 095113 - ACOUSTICAL PANEL CEILINGS

- C. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical panels treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

### 2.4 METAL SUSPENSION SYSTEMS, GENERAL

- A. Metal Suspension-System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635/C 635M.
- B. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
  - 1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing according to ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.
    - a. Corrosion Protection: Stainless-steel components complying with ASTM F 593 and ASTM F 594, Group 1 Alloy 304 or 316 for bolts; Alloy 304 or 316 for anchor.
  - 2. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing according to ASTM E 1190, conducted by a qualified testing and inspecting agency.
- C. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
  - 1. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304, nonmagnetic.
  - 2. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch- diameter wire.
- D. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.
- E. Angle Hangers: Angles with legs not less than 7/8 inch wide; formed with 0.04-inch- thick, galvanized-steel sheet complying with ASTM A 653/A 653M, G90 coating designation; with bolted connections and 5/16-inch- diameter bolts.
- F. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.
- G. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces may include one of the following:

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1. 20 ga metal studs per specifications
  2. Purpose-build telescoping strut : USB “Telescoping Seismic Compression Post
  3. Chicago Metallic “Dyna Strut”
- H. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical panels in place.
- I. Hold-Down Clips: Where indicated, provide manufacturer's standard hold-down clips spaced 24 inches o.c. on all cross tees.
- J. Impact Clips: Where indicated, provide manufacturer's standard impact-clip system designed to absorb impact forces against acoustical panels.
- K. Clean-Room Gasket System: Where indicated, provide manufacturer's standard system, including manufacturer's standard gasket and related adhesives, tapes, seals, and retention clips, designed to seal out foreign material from and maintain positive pressure in clean room.

### **2.5 METAL SUSPENSION SYSTEM**

- 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. Armstrong World Industries, Inc.
  2. CertainTeed Corp.
  3. Chicago Metallic Corporation.
  4. USG Interiors, Inc.; Subsidiary of USG Corporation.
- B. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 coating designation; with prefinished 15/16-inch- wide metal caps on flanges.
1. Structural Classification: Heavy-duty system.
  2. End Condition of Cross Runners: Override (stepped) or butt-edge type.
  3. Face Design: Flat, flush.
  4. Cap Material: Steel cold-rolled sheet.
  5. Cap Finish: Painted white.

### **2.6 METAL EDGE MOLDINGS AND TRIM**

- 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. Armstrong World Industries, Inc.
  2. CertainTeed Corp.
  3. Chicago Metallic Corporation.
  4. Fry Reglet Corporation.
  5. Gordon, Inc.
  6. USG Interiors, Inc.; Subsidiary of USG Corporation.

## **SECTION 095113 - ACOUSTICAL PANEL CEILINGS**

- B. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.
1. Provide manufacturer's standard edge moldings that fit acoustical panel edge details and suspension systems indicated and that match width and configuration of exposed runners unless otherwise indicated.
  2. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member unless otherwise indicated.
  3. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

### **2.7 ACOUSTICAL SEALANT**

- A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
1. Acoustical Sealant for Exposed and Concealed Joints:
    - a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
    - b. USG Corporation; SHEETROCK Acoustical Sealant.
  2. Acoustical Sealant for Concealed Joints:
    - a. Henkel Corporation; OSI Pro-Series SC-175 Acoustical Sound Sealant.
    - b. Pecora Corporation; AIS-919.
    - c. Tremco, Inc.; Tremco Acoustical Sealant.
- B. Acoustical Sealant: Manufacturer's standard sealant complying with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
1. Exposed and Concealed Joints: Nonsag, paintable, nonstaining latex sealant.
  2. Concealed Joints: Nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

## **SECTION 095113 - ACOUSTICAL PANEL CEILINGS**

- B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 PREPARATION**

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

### **3.3 INSTALLATION**

- A. General: Install acoustical panel ceilings to comply with ASTM C 636/C 636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
  - 1. Fire-Rated Assembly: Install fire-rated ceiling systems according to tested fire-rated design.
- B. Suspend ceiling hangers from building's structural members and as follows:
  - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
  - 2. Splay hangers only where required and, if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
  - 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
  - 4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
  - 5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
  - 6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
  - 7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
  - 8. Do not attach hangers to steel deck tabs.
  - 9. Do not attach hangers to steel roof deck. Attach hangers to structural members.

## **SECTION 095113 - ACOUSTICAL PANEL CEILINGS**

10. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
  11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
  2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
  3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
1. Arrange directionally patterned acoustical panels as follows:
    - a. As indicated on reflected ceiling plans.
  2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.
  3. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
  4. For reveal-edged panels on suspension-system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension-system surfaces and panel faces flush with bottom face of runners.
  5. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
  6. Install hold-down or impact clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer's written instructions unless otherwise indicated.
  7. Install clean-room gasket system in areas indicated, sealing each panel and fixture as recommended by panel manufacturer's written instructions.
  8. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

## **SECTION 095113 - ACOUSTICAL PANEL CEILINGS**

### **3.4 CLEANING**

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

**END OF SECTION 095113**

## **SECTION 096513 - RESILIENT BASE AND ACCESSORIES**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section Includes:
  - 1. Resilient base.
  - 2. Resilient molding accessories.
- B. Related Sections:
  - 1. Division 09 Section "Resilient Sheet Flooring" for resilient sheet floor coverings.

#### **1.3 SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For each type of product indicated.

#### **1.4 QUALITY ASSURANCE**

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

#### **1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

#### **1.6 PROJECT CONDITIONS**

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following time periods:
  - 1. 48 hours before installation.

## **SECTION 096513 - RESILIENT BASE AND ACCESSORIES**

2. During installation.
  3. 48 hours after installation.
- B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Install resilient products after other finishing operations, including painting, have been completed.

### **PART 2 - PRODUCTS**

#### **2.1 RESILIENT BASE – RUB:**

- A. Resilient Base:
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. Armstrong World Industries, Inc.
    - b. Burke Mercer Flooring Products; Division of Burke Industries, Inc.
    - c. Endura Rubber Flooring; Division of Burke Industries, Inc.
    - d. Flexco, Inc.
    - e. Johnsonite.
    - f. Mondo Rubber International, Inc.
    - g. Musson, R. C. Rubber Co.
    - h. PRF USA, Inc.
    - i. Roppe Corporation, USA.
- B. Resilient Base Standard: ASTM F 1861.
1. Material Requirement: Type TS (rubber, vulcanized thermoset).
  2. Manufacturing Method: Group I (solid, homogeneous).
  3. Style: Cove (base with toe) or as indicated.
- C. Minimum Thickness: 0.125 inch.
- D. Height: As indicated on Drawings.
- E. Lengths: Coils in manufacturer's standard length.
- F. Outside Corners: Preformed.
- G. Inside Corners: Job formed.
- H. Finish: Satin.
- I. Colors and Patterns: As selected by ARCHITECT from full range of industry colors.



## **SECTION 096513 - RESILIENT BASE AND ACCESSORIES**

### **2.2 RESILIENT MOLDING ACCESSORY**

#### **A. Resilient Molding Accessory:**

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. Burke Mercer Flooring Products; Division of Burke Industries, Inc.
  - b. Flexco, Inc.
  - c. Johnsonite.
  - d. R.C.A. Rubber Company (The).
  - e. Roppe Corporation, USA.

#### **B. Description: Transition strips.**

#### **C. Material: Vinyl.**

#### **D. Profile and Dimensions: As indicated.**

#### **E. Colors and Patterns: As selected by ARCHITECT from full range of industry colors.**

### **2.3 INSTALLATION MATERIALS**

#### **A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.**

#### **B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.**

1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
  - a. Cove Base Adhesives: Not more than 50 g/L.
  - b. Rubber Floor Adhesives: Not more than 60 g/L.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the WORK.
- B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

## **SECTION 096513 - RESILIENT BASE AND ACCESSORIES**

- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 PREPARATION**

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- C. Do not install resilient products until they are same temperature as the space where they are to be installed.
  - 1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- D. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

### **3.3 RESILIENT BASE INSTALLATION**

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, caseWORK and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Job-Formed Corners:
  - 1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends.
  - 2. Inside Corners: Use straight pieces of maximum lengths possible.

### **3.4 RESILIENT ACCESSORY INSTALLATION**

- A. Comply with manufacturer's written instructions for installing resilient accessories.

## **SECTION 096513 - RESILIENT BASE AND ACCESSORIES**

- B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of carpet or resilient floor covering that would otherwise be exposed.

### **3.5 CLEANING AND PROTECTION**

- A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.
- B. Perform the following operations immediately after completing resilient product installation:
  - 1. Remove adhesive and other blemishes from exposed surfaces.
  - 2. Sweep and vacuum surfaces thoroughly.
  - 3. Damp-mop surfaces to remove marks and soil.
- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover resilient products until Substantial Completion.

**END OF SECTION**

## **SECTION 096516 - RESILIENT SHEET FLOORING**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section Includes:

- 1. Vinyl sheet floor covering, with and without backing.

- B. Related Sections:

- 1. Division 03 Section "Floor Substrate Preparation" for installation of finishes over.
  - 2. Division 09 Section "Resilient Base and Accessories" for resilient base, and other accessories installed with resilient floor coverings.

#### **1.3 SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For each type of floor covering. Include floor covering layouts, locations of seams, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
  - 1. Show details of special patterns.
- C. Samples for Initial Selection: For each type of floor covering indicated.
- D. Qualification Data: For qualified Installer.
- E. Maintenance Data: For each type of floor covering to include in maintenance manuals.

#### **1.4 QUALITY ASSURANCE**

- A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor covering installation and seaming method indicated.
- B. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
  - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

## **SECTION 096516 - RESILIENT SHEET FLOORING**

### **1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Store floor coverings and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store rolls upright.

### **1.6 PROJECT CONDITIONS**

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 85 deg F, in spaces to receive floor coverings during the following time periods:
  - 1. 48 hours before installation.
  - 2. During installation.
  - 3. 48 hours after installation.
- B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Close spaces to traffic during floor covering installation.
- D. Close spaces to traffic for 48 hours after floor covering installation.
- E. Install floor coverings after other finishing operations, including painting, have been completed.

### **1.7 EXTRA MATERIALS**

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Floor Covering: Furnish quantity not less than 10 linear feet for every 500 linear feet or fraction thereof, in roll form and in full roll width for each color, pattern, and type of floor covering installed.

## **PART 2 - PRODUCTS**

### **2.1 VINYL SHEET FLOOR COVERING –SV:**

- A. Basis of Design Products: Provide the following, or approved equal:
  - 1. SV/SV2: Armstrong World Industries, Inc.
    - a. SV: Medintech
    - b. SV2: Connection Corlon
  - 2. SV3: Lonseal, Inc.
    - a. Lonwood Natural

## **SECTION 096516 - RESILIENT SHEET FLOORING**

- B. Unbacked Vinyl Sheet Floor Covering: ASTM F 1913, 0.080 inch thick.
- C. Vinyl Sheet Floor Covering with Backing: ASTM F 1303.
  - 1. Type (Binder Content): Type II, minimum binder content of 34 percent.
  - 2. Wear-Layer Thickness: Grade 1.
  - 3. Overall Thickness: As standard with manufacturer.
  - 4. Backing Class: Class A (fibrous).
- D. Sheet Width: As standard with manufacturer.
- E. Seaming Method: Heat welded.
- F. Colors and Patterns: Up to (3) three colors for each style, as selected by ARCHITECT from full range of industry colors.

### **2.2 INSTALLATION MATERIALS**

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit floor covering and substrate conditions indicated.
  - 1. Use adhesives that have a VOC content of not more than 50 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Seamless-Installation Accessories:
  - 1. Heat-Welding Bead: Manufacturer's solid-strand product for heat welding seams.
    - a. Color: Match floor covering.
- D. Floor Polish: Provide protective liquid floor polish products as recommended by manufacturer.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor coverings.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

## **SECTION 096516 - RESILIENT SHEET FLOORING**

### **3.2 PREPARATION**

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of floor coverings.
- B. Concrete Substrates: Prepare according to ASTM F 710.
  - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
  - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
  - 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
  - 4. Moisture Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install floor coverings until they are same temperature as space where they are to be installed.
  - 1. Move floor coverings and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- E. Sweep and vacuum clean substrates to be covered by floor coverings immediately before installation.

### **3.3 FLOOR COVERING INSTALLATION**

- A. Comply with manufacturer's written instructions for installing floor coverings.
- B. Unroll floor coverings and allow them to stabilize before cutting and fitting.
- C. Lay out floor coverings as follows:
  - 1. Maintain uniformity of floor covering direction.
  - 2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches away from parallel joints in floor covering substrates.
  - 3. Match edges of floor coverings for color shading at seams.
  - 4. Avoid cross seams.
- D. Scribe and cut floor coverings to butt neatly and tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, and door frames.
- E. Extend floor coverings into toe spaces, door reveals, closets, and similar openings.
- F. Maintain reference markers, holes, or openings that are in place or marked for future cutting by repeating on floor coverings as marked on substrates. Use chalk or other nonpermanent marking device.

## **SECTION 096516 - RESILIENT SHEET FLOORING**

- G. Install floor coverings on covers for telephone and electrical ducts and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of floor coverings installed on covers and adjoining floor covering. Tightly adhere floor covering edges to substrates that abut covers and to cover perimeters.
- H. Adhere floor coverings to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- I. Seamless Installation:
  - 1. Heat-Welded Seams: Comply with ASTM F 1516. Rout joints and use welding bead to permanently fuse sections into a seamless floor covering. Prepare, weld, and finish seams to produce surfaces flush with adjoining floor covering surfaces.

### **3.4 CLEANING AND PROTECTION**

- A. Comply with manufacturer's written instructions for cleaning and protection of floor coverings.
- B. Perform the following operations immediately after completing floor covering installation:
  - 1. Remove adhesive and other blemishes from floor covering surfaces.
  - 2. Sweep and vacuum floor coverings thoroughly.
  - 3. Damp-mop floor coverings to remove marks and soil.
- C. Protect floor coverings from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Floor Polish: Remove soil, visible adhesive, and surface blemishes from floor covering before applying liquid floor polish.
  - 1. Apply as recommended by manufacturer.
- E. Cover floor coverings until Substantial Completion.

**END OF SECTION**



## **SECTION 096816 - SHEET CARPETING**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section Includes:
  - 1. Tufted carpet.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For the following, including installation recommendations for each type of substrate:
  - 1. Carpet: For each type indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
- B. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

#### **1.4 INFORMATIONAL SUBMITTALS**

- A. Product Test Reports: For carpet, for tests performed by a qualified testing agency.
- B. Sample Warranties: For special warranties.

#### **1.5 CLOSEOUT SUBMITTALS**

- A. Maintenance Data: For carpet to include in maintenance manuals. Include the following:
  - 1. Methods for maintaining carpet, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
  - 2. Precautions for cleaning materials and methods that could be detrimental to carpet.

#### **1.6 MAINTENANCE MATERIAL SUBMITTALS**

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

## **SECTION 096816 - SHEET CARPETING**

1. Carpet: Full-width rolls equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd..

### **1.7 QUALITY ASSURANCE**

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

### **1.8 DELIVERY, STORAGE, AND HANDLING**

- A. Comply with CRI 104.

### **1.9 FIELD CONDITIONS**

- A. Comply with CRI 104 for temperature, humidity, and ventilation limitations.
- B. Environmental Limitations: Do not deliver or install carpet until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at occupancy levels during the remainder of the construction period.
- C. Do not install carpet over concrete slabs until slabs have cured, are sufficiently dry to bond with adhesive, and have pH range recommended by carpet manufacturer.
- D. Where demountable partitions or other items are indicated for installation on top of carpet, install carpet before installing these items.

### **1.10 WARRANTY**

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

## **PART 2 - PRODUCTS**

### **2.1 TUFTED CARPET – CPT:**

- A. Basis-of-Design Product: Subject to compliance with requirements, provide the following or approved equal:
  1. MFR: Shaw
  2. Style: Meadow

## SECTION 096816 - SHEET CARPETING

3. Type: Pattern Loop
4. Machine Gage: 1/10"
5. Yarn Weight Tufted: 28 oz/yd
6. Backing: Ultraloc MP High Performance Reactive Polyurethane
7. Yarn Content: 100 eco\*solution q nylon
8. Soil Resistance: S.S.S Shaw Soil Protection, florsept antimicrobial
9. Dye Method: 78% solution dyed, 22% yarn dyed
10. Width: 12'-0"

B. Color: As selected by ARCHITECT from manufacturer's full range.

C. Performance Characteristics: As follows:

1. Appearance Retention Rating: Moderate traffic, 2.5 minimum per ASTM D 7330.
2. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm.
3. Dry Breaking Strength: Not less than 100 lbf per ASTM D 2646.
4. Tuft Bind: Not less than 5 lbf per ASTM D 1335.
5. Delamination: Not less than 3.5 lbf/in. per ASTM D 3936.
6. Resistance to Insects: Comply with AATCC 24.
7. Colorfastness to Crocking: Not less than 4, wet and dry, per AATCC 165.
8. Colorfastness to Light: Not less than 4 after 40 AFU (AATCC fading units) per AATCC 16, Option E.
9. Antimicrobial Activity: Not less than 2-mm halo of inhibition for gram-positive bacteria; not less than 1-mm halo of inhibition for gram-negative bacteria; no fungal growth; per AATCC 174.
10. Electrostatic Propensity: Less than 3.5 kV per AATCC 134.

### 2.2 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet manufacturer.
- B. Adhesives: Water-resistant, mildew-resistant, nonstaining type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet and is recommended or provided by carpet manufacturer.
1. Use adhesives with VOC content not more than 50 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Seam Adhesive: Hot-melt adhesive tape or similar product recommended by carpet manufacturer for sealing and taping seams and butting cut edges at backing to form secure seams and to prevent pile loss at seams.

## **SECTION 096816 - SHEET CARPETING**

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet performance. Examine carpet for type, color, pattern, and potential defects.
- B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
  - 1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet manufacturer.
  - 2. Subfloor finishes comply with requirements specified in Section 033000 "Cast-in-Place Concrete" for slabs receiving carpet.
  - 3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### **3.2 PREPARATION**

- A. General: Comply with CRI 104, Section 7.3, "Site Conditions; Floor Preparation," and with carpet manufacturer's written installation instructions for preparing substrates.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch, unless more stringent requirements are required by manufacturer's written instructions.
- C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet manufacturer.
- D. Broom and vacuum clean substrates to be covered immediately before installing carpet.

#### **3.3 INSTALLATION**

- A. Comply with CRI 104 and carpet manufacturer's written installation instructions for the following:
  - 1. Direct-Glue-Down Installation: Comply with CRI 104, Section 9, "Direct Glue-Down Installation."
- B. Do not bridge building expansion joints with carpet.

## **SECTION 096816 - SHEET CARPETING**

- C. Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet manufacturer.
- D. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- E. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.

### **3.4 CLEANING AND PROTECTING**

- A. Perform the following operations immediately after installing carpet:
  - 1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet manufacturer.
  - 2. Remove yarns that protrude from carpet surface.
  - 3. Vacuum carpet using commercial machine with face-beater element.
- B. Protect installed carpet to comply with CRI 104, Section 16, "Protecting Indoor Installations."
- C. Protect carpet against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet manufacturer.

**END OF SECTION 096816**

## **SECTION 099123 - INTERIOR PAINTING**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Surface preparation and the application of paint systems on interior surfaces. Surfaces may include the following interior substrates:
  - 1. Concrete.
  - 2. Steel.
  - 3. Cast iron.
  - 4. Galvanized metal.
  - 5. Aluminum (not anodized or otherwise coated).
  - 6. Wood.
  - 7. Gypsum board.
- B. Related Requirements:
  - 1. Division 05 Sections for shop priming of metal substrates with primers specified in this Section.
  - 2. Division 08 Sections for factory priming doors with primers specified in this Section.
  - 3. Division 09 Section "Exterior Painting" for surface preparation and the application of paint systems on exterior substrates.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
- B. Samples for Initial Selection: For each type of topcoat product.

#### **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. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

## **SECTION 099123 - INTERIOR PAINTING**

### **1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
  - 1. Maintain containers in clean condition, free of foreign materials and residue.
  - 2. Remove rags and waste from storage areas daily.

### **1.6 FIELD CONDITIONS**

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Basis of Design Manufacturer: Subject to compliance with requirements, provide the following or approved equal:
  - 1. Benjamin Moore & Co.
- B. Products of other manufacturers will be considered in accordance with the substation procedures specified. Requests for substitutions must be accompanied by the following information for each product proposed for use:
  - 1. Composition analysis: Include listing of paint constituents by weight listed as pigment and vehicle for white color. Identify each pigment component and its percentage of 100 percent pigment; list total pigment content by weight. Identify each vehicle component and its percentage of 100 percent of vehicle; list total vehicle content by weight.
  - 2. Manufacturer's recommendation for use; include limitations.
  - 3. Manufacturer's recommended primers.
- C. Product Composition Acceptance Criteria:
  - 1. Solids by Weight: Plus or minus 2 percent of named product.
  - 2. Resin Content: Percentage of total vehicle, not more than 1 percent less than named product.
  - 3. Resin Type: Resin of higher preference may be used in lieu of resin of lower preference.
  - 4. Titanium Dioxide Content: Percentage of total pigment, not more than 2 percent less than named product.

### **2.2 PAINT, GENERAL**

- A. Material Compatibility:

## **SECTION 099123 - INTERIOR PAINTING**

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
  2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- B. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction.
1. Flat Paints and Coatings: 50 g/L.
  2. Nonflat Paints and Coatings: 150 g/L.
  3. Dry-Fog Coatings: 400 g/L.
  4. Primers, Sealers, and Undercoaters: 200 g/L.
  5. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
  6. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
  7. Pretreatment Wash Primers: 420 g/L.
  8. Floor Coatings: 100 g/L.
  9. Shellacs, Clear: 730 g/L.
  10. Shellacs, Pigmented: 550 g/L.
- C. Colors: Up to (7) seven colors as selected by ARCHITECT from manufacturer's full range.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the WORK.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
1. Concrete: 12 percent.
  2. Wood: 15 percent.
  3. Gypsum Board: 12 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Plaster Substrates: Verify that plaster is fully cured.
- E. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- F. Proceed with coating application only after unsatisfactory conditions have been corrected.
1. Application of coating indicates acceptance of surfaces and conditions.



## **SECTION 099123 - INTERIOR PAINTING**

### **3.2 PREPARATION**

- A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
  - 1. After completing painting operations, use WORKers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
  - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceed that permitted in manufacturer's written instructions.
- F. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:
  - 1. SSPC-SP 2, "Hand Tool Cleaning."
  - 2. SSPC-SP 3, "Power Tool Cleaning."
  - 3. SSPC-SP 7/NACE No. 4, "Brush-off Blast Cleaning."
  - 4. SSPC-SP 11, "Power Tool Cleaning to Bare Metal."
- G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- I. Aluminum Substrates: Remove loose surface oxidation.
- J. Wood Substrates:
  - 1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
  - 2. Sand surfaces that will be exposed to view, and dust off.
  - 3. Prime edges, ends, faces, undersides, and backsides of wood.
  - 4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

## SECTION 099123 - INTERIOR PAINTING

### 3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
  - 1. Use applicators and techniques suited for paint and substrate indicated.
  - 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
  - 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
  - 4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
  - 5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security WORK:
  - 1. Paint the following WORK where exposed in equipment rooms:
    - a. Equipment, including panelboards and switch gear.
    - b. Uninsulated metal piping.
    - c. Uninsulated plastic piping.
    - d. Pipe hangers and supports.
    - e. Metal conduit.
    - f. Plastic conduit.
    - g. Tanks that do not have factory-applied final finishes.
    - h. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
  - 2. Paint the following WORK where exposed in occupied spaces:
    - a. Equipment, including panelboards.
    - b. Uninsulated metal piping.
    - c. Uninsulated plastic piping.
    - d. Pipe hangers and supports.
    - e. Metal conduit.
    - f. Plastic conduit.

## **SECTION 099123 - INTERIOR PAINTING**

- g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
- 3. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

### **3.4 CLEANING AND PROTECTION**

- A. At end of each WORK day, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect WORK of other trades against damage from paint application. Correct damage to WORK of other trades by cleaning, repairing, replacing, and refinishing, as approved by ARCHITECT, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

### **3.5 INTERIOR PAINTING SCHEDULE**

- A. Gypsum Wallboard:
  - 1. Latex System: (Typical throughout unless otherwise noted)
    - a. Prime Coat: Moorcraft Super Spec Latex Enamel Undercoater & Primer Sealer (253); 1.5 mils DFM
    - b. Intermediate Coat: Same as top coat.
    - c. Topcoat: Moorcraft Super Spec Latex Pearl Finsh (277); 1.3 mils DFM
- B. Steel Substrates:
  - 1. Latex over Alkyd Primer System:
    - a. Prime Coat: Primer, alkyd, anti-corrosive, for metal.
    - b. Intermediate Coat: Latex, interior, matching topcoat.
    - c. Topcoat: Latex, interior, semi-gloss.
- C. Galvanized-Metal Substrates:
  - 1. Latex over Waterborne Primer System:
    - a. Prime Coat: Primer, galvanized, water based.
    - b. Intermediate Coat: Latex, interior, matching topcoat.
    - c. Topcoat: Latex, interior, semi-gloss.
- D. Fiberglass and Plastic Substrates:

## **SECTION 099123 - INTERIOR PAINTING**

1. Latex System:
  - a. Prime Coat: Primer, bonding, water based.
  - b. Intermediate Coat: Latex, interior, matching topcoat.
  - c. Topcoat: Latex, interior, semi-gloss

**END OF SECTION**

## **SECTION 101100 - VISUAL DISPLAY SURFACES**

### **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. Markerboards.
  - 2. Tackboards.

#### **1.3 DEFINITIONS**

- A. Tackboard: Framed or unframed, tackable, visual display board assembly.
- B. Visual Display Board Assembly: Visual display surface that is factory fabricated into composite panel form, either with or without a perimeter frame; includes chalkboards, markerboards, and tackboards.
- C. Visual Display Surface: Surfaces that are used to convey information visually, including surfaces of chalkboards, markerboards, tackboards, and surfacing materials that are not fabricated into composite panel form but are applied directly to walls.

#### **1.4 SUBMITTALS**

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for visual display surfaces.
- B. Warranties: Sample of special warranties.

#### **1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver factory-built visual display surfaces, including factory-applied trim where indicated, completely assembled in one piece without joints, where possible. If dimensions exceed maximum manufactured panel size, provide two or more pieces of equal length as acceptable to ARCHITECT. When overall dimensions require delivery in separate units, prefit components at the factory, disassemble for delivery, and make final joints at the site.
- B. Store visual display surfaces vertically with packing materials between each unit.

## **SECTION 101100 - VISUAL DISPLAY SURFACES**

### **1.6 PROJECT CONDITIONS**

- A. Environmental Limitations: Do not deliver or install visual display surfaces until spaces are enclosed and weathertight, wet WORK in spaces is complete and dry, WORK above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Verify actual dimensions of construction contiguous with visual display surfaces by field measurements before fabrication.
  - 1. Allow for trimming and fitting where taking field measurements before fabrication might delay the WORK.

### **1.7 WARRANTY**

- A. Special Warranty for Porcelain-Enamel Face Sheets: Manufacturer's standard form in which manufacturer agrees to repair or replace porcelain-enamel face sheets that fail in materials or WORKmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Surfaces lose original writing and erasing qualities.
    - b. Surfaces exhibit crazing, cracking, or flaking.

## **PART 2 - PRODUCTS**

### **2.1 MARKERBOARD ASSEMBLIES**

- A. Porcelain-Enamel Markerboards: Balanced, high-pressure, factory-laminated markerboard assembly of three-ply construction consisting of backing sheet, core material, and 0.021-inch-thick, porcelain-enamel face sheet with low-gloss finish.
  - 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. AARCO Products, Inc.
    - b. Best-Rite Manufacturing.
    - c. Claridge Products and Equipment, Inc.
    - d. Egan Visual Inc.
    - e. Ghent Manufacturing, Inc.
    - f. PolyVision Corporation; a Steelcase company.
    - g. Tri-Best Visual Display Products.
  - 2. Manufacturer's Standard Core: Minimum 1/4 inch thick, with manufacturer's standard moisture-barrier backing.
  - 3. Laminating Adhesive: Manufacturer's standard, moisture-resistant thermoplastic type.

## SECTION 101100 - VISUAL DISPLAY SURFACES

- a. Marsh Industries, Inc.; Visual Products Group.

### 2.2 MARKERBOARD ACCESSORIES

- A. Aluminum Frames and Trim: Fabricated from not less than 0.062-inch- thick, extruded aluminum; standard size and shape.
  - 1. Factory-Applied Trim: Manufacturer's standard.
- B. Chalktray: Manufacturer's standard, continuous. Provide one of the following:
  - 1. Box Type: Extruded aluminum with slanted front, grooved tray, and cast-aluminum end closures.
  - 2. Solid Type: Extruded aluminum with ribbed section and smoothly curved exposed ends.

### 2.3 TACKBOARD ASSEMBLIES

- 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. A-1 Visual Systems.
  - 2. AARCO Products, Inc.
  - 3. ADP Lemco, Inc.
  - 4. Bangor Cork Company, Inc.
  - 5. Best-Rite Manufacturing.
  - 6. Claridge Products and Equipment, Inc.
  - 7. Egan Visual Inc.
  - 8. EverProducts by Glenroy Inc.
  - 9. Ghent Manufacturing, Inc.
  - 10. PolyVision Corporation; a Steelcase company.
- B. Natural-Cork Tackboard: 1/4-inch- thick, natural cork sheet factory laminated to 1/4-inch-thick hardboard or particleboard backing.
- C. Frame: Manufacturer standard aluminum frame.
- D. Size: As indicated on drawings.

### 2.4 FABRICATION

- A. Porcelain-Enamel Visual Display Assemblies: Laminate porcelain-enamel face sheet and backing sheet to core material under heat and pressure with manufacturer's standard flexible, waterproof adhesive.
- B. Visual Display Boards: Factory assemble visual display boards unless otherwise indicated.
  - 1. Where factory-applied trim is indicated, trim shall be assembled and attached to visual display boards at manufacturer's factory before shipment.

## **SECTION 101100 - VISUAL DISPLAY SURFACES**

- C. Aluminum Frames and Trim: Fabricate units straight and of single lengths, keeping joints to a minimum. Miter corners to a neat, hairline closure.
  - 1. Where factory-applied trim is indicated, trim shall be assembled and attached to visual display units at manufacturer's factory before shipment.

### **2.5 GENERAL FINISH REQUIREMENTS**

- A. Comply with NAAMM's "Metal Finishes Manual for ARCHITECTural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished WORK: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

### **2.6 ALUMINUM FINISHES**

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.
- B. Color Anodic Finish: AAMA 611, AA-M12C22A32/A34, Class II, 0.010 mm or thicker.
- C. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

### **2.7 VISUAL DISPLAY SURFACE SCHEDULE**

- A. Visual Display Board:
  - 1. Markerboard: Porcelain-enamel markerboard assembly.
    - a. Color: White.
  - 2. Corners: Square.
  - 3. Size: 2'-0"Wx2'-6"H or as indicated on Drawings.
  - 4. Mounting: Wall and Door.
  - 5. Mounting Height: 4'-0" AFF or as indicated on Drawings.
  - 6. Factory-Applied Aluminum Trim: Manufacturer's standard with finish.
  - 7. Accessories:
    - a. Chalktray: Box or solid type.



## **SECTION 101100 - VISUAL DISPLAY SURFACES**

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the WORK.
- B. Examine walls and partitions for proper preparation and backing for visual display surfaces.
- C. Examine walls and partitions for suitable framing depth where sliding visual display units will be installed.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

#### **3.2 PREPARATION**

- A. Comply with manufacturer's written instructions for surface preparation.
- B. Clean substrates of substances that could impair the performance of and affect the smooth, finished surfaces of visual display boards, including dirt, mold, and mildew.
- C. Prepare surfaces to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, defects, projections, depressions, and substances that will impair bond between visual display surfaces and wall surfaces.

#### **3.3 INSTALLATION, GENERAL**

- A. General: Install visual display surfaces in locations and at mounting heights indicated on Drawings, or if not indicated, at heights indicated below. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.
  - 1. Mounting Height: 36 inches above finished floor to top of chalktray or as indicated in drawings.

#### **3.4 CLEANING AND PROTECTION**

- A. Clean visual display surfaces according to manufacturer's written instructions. Attach one cleaning label to visual display surface in each room.
- B. Touch up factory-applied finishes to restore damaged or soiled areas.
- C. Cover and protect visual display surfaces after installation and cleaning.

### **END OF SECTION 101100**

## **SECTION 101423 - PANEL SIGNAGE**

### **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. Room-identification signs.

#### **1.3 DEFINITIONS**

- A. Accessible: In accordance with the accessibility standard.

#### **1.4 COORDINATION**

- A. Furnish templates for placement of sign-anchorage devices embedded in permanent construction by other installers.

#### **1.5 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
- B. Shop Drawings: For panel signs.
  - 1. Include fabrication and installation details and attachments to other WORK.
  - 2. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
- C. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.
- D. Sign Schedule: Use same designations specified or indicated on Drawings or in a sign schedule.

#### **1.6 FIELD CONDITIONS**

- A. Field Measurements: Verify locations of anchorage devices embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.

## **SECTION 101423 - PANEL SIGNAGE**

### **1.7 WARRANTY**

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or Workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Deterioration of finishes beyond normal weathering.
    - b. Deterioration of embedded graphic image.
    - c. Separation or delamination of sheet materials and components.
  - 2. Warranty Period: Five years from date of Substantial Completion.

## **PART 2 - PRODUCTS**

### **2.1 SIGNS**

- 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. Ace Sign Systems, Inc.
  - 2. Advance Corporation; Braille-Tac Division.
  - 3. APCO Graphics, Inc.
  - 4. ASE, Inc.
  - 5. ASI Sign Systems, Inc.
  - 6. Best Sign Systems Inc.
  - 7. Bunting Graphics, Inc.
  - 8. Clarke Systems.
  - 9. InPro Corporation.
  - 10. Mohawk Sign Systems.
  - 11. Seton Identification Products.
- B. Room-Identification Sign: Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; : As indicated on Drawings included with these specifications.

### **2.2 PANEL-SIGN MATERIALS**

- A. Steel Materials:
  - 1. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating, either commercial or forming steel.
  - 2. Steel Members Fabricated from Plate or Bar Stock: ASTM A 529/A 529M or ASTM A 572/A 572M, 42,000-psi (290-MPa) minimum yield strength.
  - 3. For steel exposed to view on completion, provide materials having flat, smooth surfaces without blemishes. Do not use materials whose surfaces exhibit pitting, seam marks, roller marks, rolled trade names, or roughness.

## **SECTION 101423 - PANEL SIGNAGE**

- B. Acrylic Sheet: ASTM D 4802, category as standard with manufacturer for each sign, Type UVF (UV filtering).
- C. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

### **2.3 ACCESSORIES**

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, noncorrosive and compatible with each material joined, and complying with the following:
  - 1. Use concealed fasteners and anchors unless indicated to be exposed.
  - 2. Exposed Metal-Fastener Components, General:
    - a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.
    - b. Fastener Heads: For nonstructural connections, use oval countersunk screws and bolts with tamper-resistant spanner-head slots unless otherwise indicated.
  - 3. Sign Mounting Fasteners:
    - a. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of sign material or screwed into back of sign assembly, unless otherwise indicated.
    - b. Projecting Studs: Threaded studs with sleeve spacer, welded or brazed to back of sign material or screwed into back of sign assembly, unless otherwise indicated.
    - c. Through Fasteners: Exposed metal fasteners matching sign finish, with type of head indicated, installed in predrilled holes.
  - 4. Inserts: Furnish inserts to be set by other trades into concrete or masonry WORK.
- B. Adhesives: As recommended by sign manufacturer and with a VOC content of 70 g/L or less for adhesives used inside the weatherproofing system and applied on-site when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Adhesives: As recommended by sign manufacturer and that 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. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045 inch thick, with adhesive on both sides.
- E. Hook-and-Loop Tape: Manufacturer's standard two-part tape consisting of hooked part on sign back and looped side on mounting surface.
- F. Magnetic Tape: Manufacturer's standard magnetic tape with adhesive on one side.

## SECTION 101423 - PANEL SIGNAGE

### 2.4 FABRICATION

- A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
  - 1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
  - 2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
  - 3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
  - 4. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
  - 5. Internally brace signs for stability and for securing fasteners.
  - 6. Provide rebates, lugs, and brackets necessary to assemble components and to attach to existing WORK. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.
- B. Surface-Engraved Graphics: Machine engrave characters and other graphic devices into panel surface indicated to produce precisely formed copy, incised to uniform depth.
  - 1. Engraved Metal: Fill engraved graphics with manufacturer's standard baked enamel.
  - 2. Engraved Opaque Acrylic Sheet: Fill engraved graphics with manufacturer's standard enamel.
  - 3. Face-Engraved Clear Acrylic Sheet: Fill engraved copy with manufacturer's standard enamel. Apply manufacturer's standard opaque background color coating to back face of acrylic sheet.
  - 4. Engraved Plastic Laminate: Engrave through exposed face ply of plastic-laminate sheet to expose contrasting core ply.
- C. Subsurface-Applied Graphics: Apply graphics to back face of clear face-sheet material to produce precisely formed image. Image shall be free of rough edges.
- D. Subsurface-Engraved Graphics: Reverse engrave back face of clear face-sheet material. Fill resulting copy with manufacturer's standard enamel. Apply opaque manufacturer's standard background color coating over enamel-filled copy.
- E. Shop- and Subsurface-Applied Vinyl: Align vinyl film in final position and apply to surface. Firmly press film from the middle outward to obtain good bond without blisters or fishmouths.
- F. Signs with Changeable Message Capability: Fabricate signs to allow insertion of changeable messages as follows:
  - 1. For snap-in changeable inserts beneath removable face sheet, furnish one suction or other device to assist in removing face sheet. Furnish initial changeable insert. Furnish two blank inserts for each sign for Owner's use.
  - 2. For slide-in changeable inserts, fabricate slot without burrs or constrictions that inhibit function. Furnish initial changeable insert. Furnish two blank inserts for each sign for Owner's use.

## **SECTION 101423 - PANEL SIGNAGE**

3. For frame to hold changeable sign panel, fabricate frame without burrs or constrictions that inhibit function. Furnish initial sign panel. Subsequent changeable sign panels are by Owner.
- G. Brackets: Fabricate brackets, fittings, and hardware for bracket-mounted signs to suit sign construction and mounting conditions indicated. Modify manufacturer's standard brackets as required.
  1. Aluminum Brackets: Factory finish brackets with baked-enamel or powder-coat finish to match Architect's sample color unless otherwise indicated.
  2. Stainless-Steel Brackets: Factory finish brackets to match Architect's sample finish unless otherwise indicated.

### **2.5 GENERAL FINISH REQUIREMENTS**

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished WORK: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished trim or border surface unless otherwise indicated.
- D. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of signage WORK.
- B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.
- C. Verify that anchor inserts are correctly sized and located to accommodate signs.
- D. Verify that electrical service is correctly sized and located to accommodate signs.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

## SECTION 101423 - PANEL SIGNAGE

### 3.2 INSTALLATION

- A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
  - 1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
  - 2. Install signs so they do not protrude or obstruct according to the accessibility standard.
  - 3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
  - 4. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- B. Room-Identification Signs and Other Accessible Signage: Install in locations on walls as indicated and according to accessibility standard.
- C. Mounting Methods:
  - 1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
    - a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until flush to surface, embedding studs in holes. Temporarily support sign in position until adhesive fully sets.
    - b. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.
  - 2. Projecting Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
    - a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place spacers on studs, place sign in position, and push until spacers are pinched between sign and substrate, embedding the stud ends in holes. Temporarily support sign in position until adhesive fully sets.
    - b. Thin or Hollow Surfaces: Place spacers on studs, place sign in position with spacers pinched between sign and substrate, and install washers and nuts on stud ends projecting through opposite side of surface, and tighten.
  - 3. Through Fasteners: Drill holes in substrate using predrilled holes in sign as template. Countersink holes in sign if required. Place sign in position and flush to surface. Install through fasteners and tighten.
  - 4. Brackets: Remove loose debris from substrate surface and install backbar or bracket supports in position so that signage is correctly located and aligned.
  - 5. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position, and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.

## **SECTION 101423 - PANEL SIGNAGE**

6. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position, and push to engage tape adhesive.
  7. Hook-and-Loop Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply sign component of two-part tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage; push to engage tape adhesive. Keep tape strips 0.250 inch away from edges to prevent visibility at sign edges when sign is initially installed or reinstalled. Apply substrate component of tape to substrate in locations aligning with tape on back of sign; push and rub well to fully engage tape adhesive to substrate.
  8. Magnetic Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position.
  9. Shim-Plate Mounting: Provide 1/8 inch thick, concealed aluminum shim plates with predrilled and countersunk holes, at locations indicated, and where other direct mounting methods are impractical. Attach plate with fasteners and anchors suitable for secure attachment to substrate. Attach signs to plate using method specified above.
- D. Field-Applied, Vinyl-Character Signs: Clean and dry substrate. Align sign characters in final position before removing release liner. Remove release liner in stages, and apply and firmly press characters into final position. Press from the middle outward to obtain good bond without blisters or fishmouths. Remove carrier film without disturbing applied vinyl film.
- E. Signs Mounted on Glass: Provide opaque sheet matching sign material and finish onto opposite side of glass to conceal back of sign.

### **3.3 ADJUSTING AND CLEANING**

- A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- B. Remove temporary protective coverings and strippable films as signs are installed.
- C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

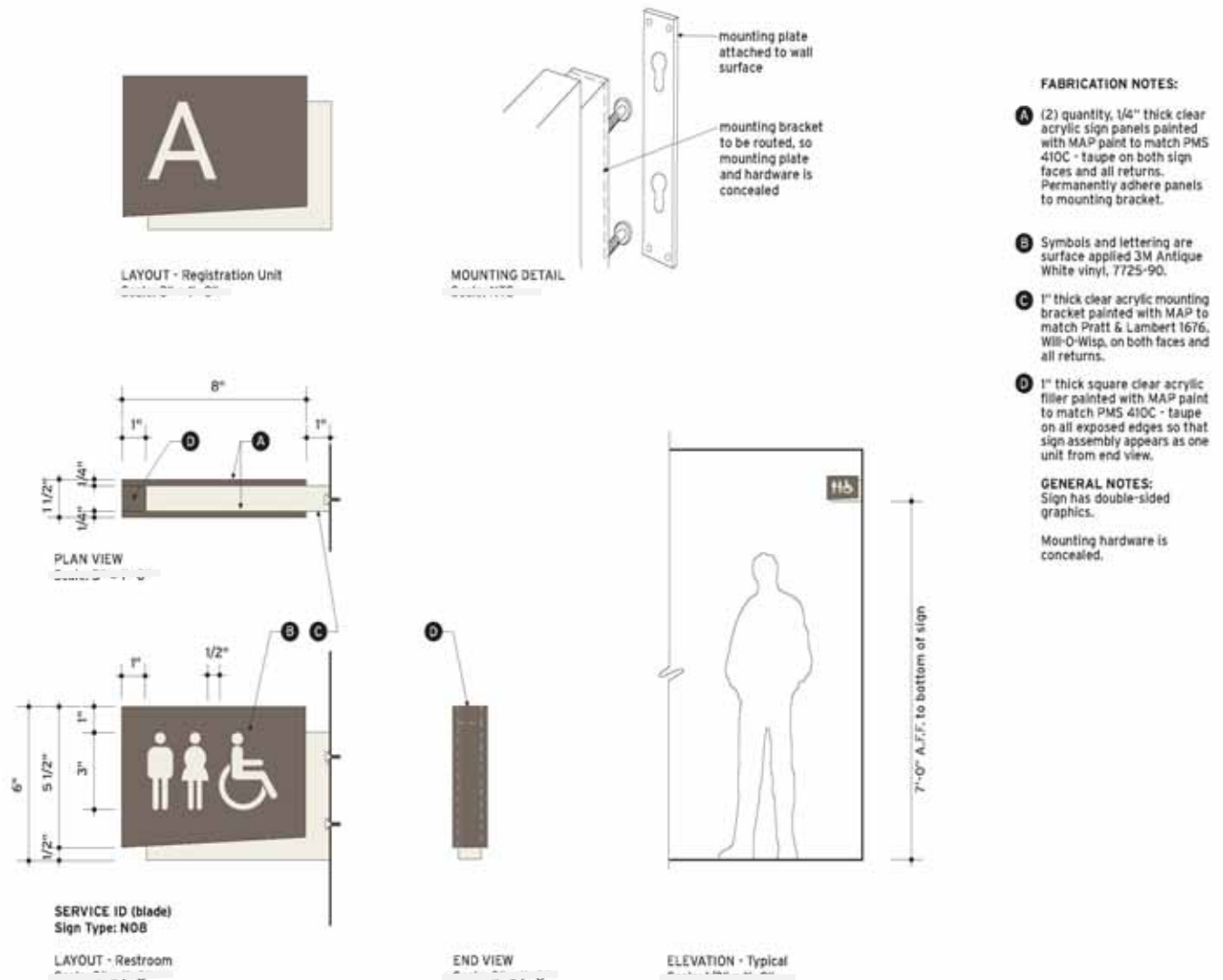


## SECTION 101423 - PANEL SIGNAGE

INTERIOR SIGNAGE SCHEDULE						
Signage Location/ Room Number	Room Name	Sign Type	Message	Req'd Graphic	In Contract	Comments
<b>LEVEL 2</b>						
STAIR 2	STAIR 2	EXIST			Alternate	Salvage and re-install
260	PUBLIC TOILET	N13	RESTROOM	YES	Alternate	ADA Unisex. Salvage exist (to Owner) & patch wall
261	PUBLIC TOILET	N13	RESTROOM	YES	Alternate	ADA Unisex. Salvage exist (to Owner) & patch wall
2402	SHELL SPACE	EXIST				Salvage and re-install two (2) signs
2226, 2234, 2235, 2319, 2370, 2372		EXIST			Alternate	Existing to remain
<b>LEVEL 3</b>						
3041	STAIR 3	EXIST			Base Bid	Salvage and re-install
3323-3325, 3332-3337	PATIENT ROOM	EXIST			Base Bid	Salvage all and re-install nine (9) room signs
3375	MSREHAB COMMON	EXIST			Base Bid	Salvage and re-install
3376	STORAGE	N12	3376		Base Bid	
3377	PUBLIC TOILET	N13	RESTROOM	YES	Base Bid	ADA Unisex
3377	PUBLIC TOILET	N08	RESTROOM	YES	Base Bid	ADA Unisex. Center above door, provide backing in wall
3378	SOLARIUM	N12	3378		Base Bid	
3379	STORAGE	N12	3379		Base Bid	
3380A	CONFERENCE	N12	3380A		Base Bid	at South door to 3380
3380B	CONFERENCE	N12	3380B		Base Bid	at North door to 3380
3381	STORAGE	N12	3381		Base Bid	
3383	OFFICE	N12	3383		Base Bid	
3384	STORAGE	N12	3384		Base Bid	
3385	STAFF TOILET	N13	STAFF RESTROOM	YES	Base Bid	ADA Unisex

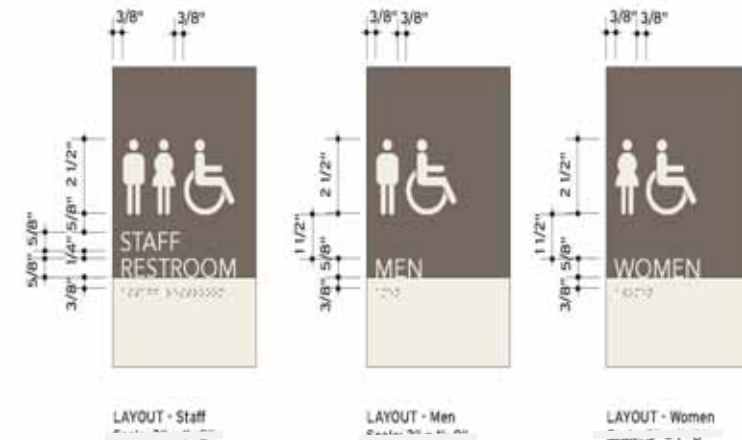
## SECTION 101423 - PANEL SIGNAGE

### TOILET ROOM SIGNAGE "N-08" – BLADE WALL MOUNTED:



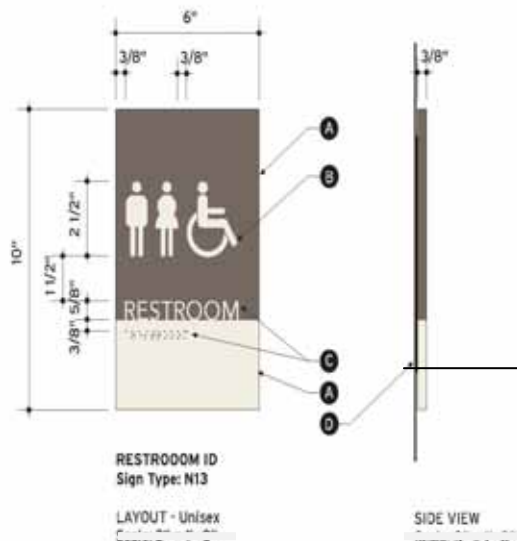
## SECTION 101423 - PANEL SIGNAGE

### TOILET ROOM SIGNAGE “N-13” - FLUSH WALL MOUNTED:



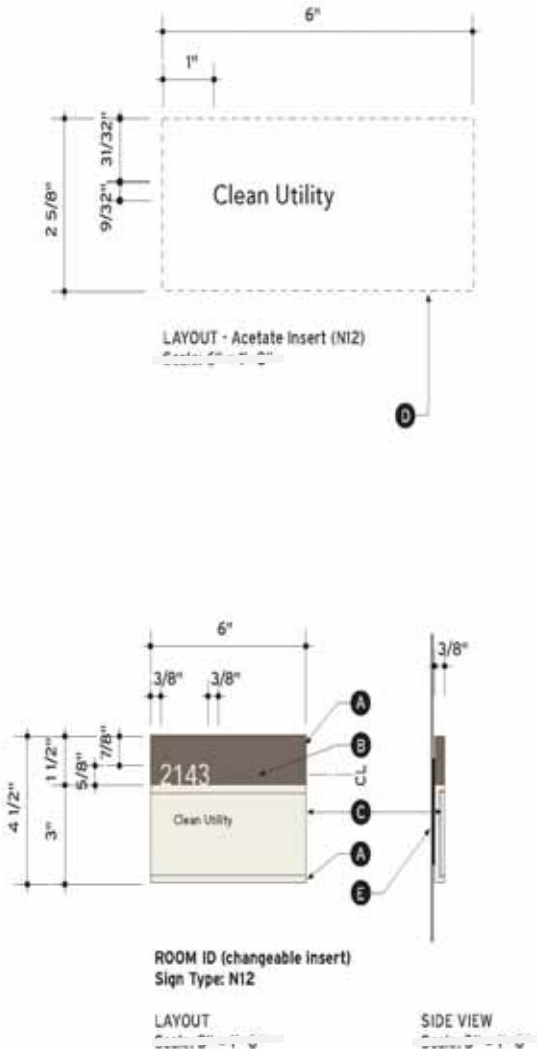
#### FABRICATION NOTES:

- A** 3/8" thick, clear acrylic sign panel with top portion painted with MAP paint to match PMS 410C - taupe; and bottom portion painted with MAP to match Pratt & Lambert 1676, Will-O-Wisp. Paint sign face and all returns.
- B** Symbols are surface applied 3M Antique White vinyl, 7725-90.
- C** Tactile numerals are Rowmark ADA applique, White 311-201, and grade 2, clear beaded Braille. **NOTE:** baseline of tactile numerals line up on edge of taupe color.
- D** Mount sign panel to wall surface with 3M VHB foam tape.



## SECTION 101423 - PANEL SIGNAGE

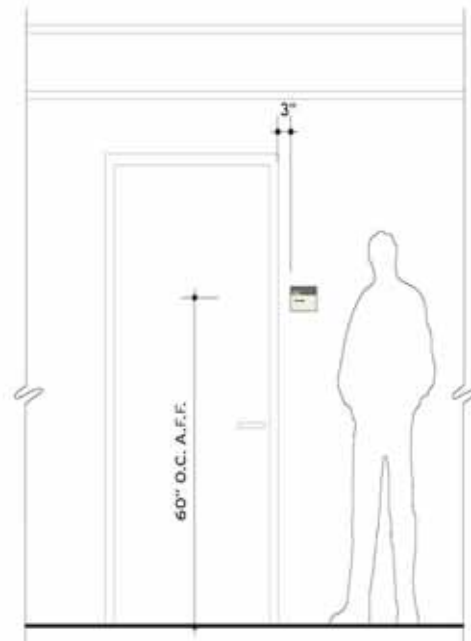
### ROOM "ID" SIGNAGE "N-12" – FLUSH WALL MOUNTED:



#### FABRICATION NOTES:

- A** 3/8" thick, clear acrylic sign panel with top portion painted with MAP paint to match PMS 410C - taupe; and bottom portion painted with MAP to match Pratt & Lambert 1676, Willi-O-Wisp. Paint sign face and all returns. **NOTE:** bottom portion of sign is routed to accept acrylic window.
- B** Tactile numerals are Rowmark ADA applique, White 311-201, and grade 2, clear beaded Braille. **NOTE:** baseline of tactile numerals line up on edge of taupe color.
- C** Rohm & Haas 3030 green edge acrylic window face with polished edges, flush with sign face. Window face pressure fits into painted acrylic panel, glue as necessary.
- D** Window accepts matte acetate insert with laser printed occupant or room name to allow color to show through. **NOTE:** Owner to provide messages.
- E** Mount sign panel to wall surface with 3M VHB foam tape.

**GENERAL NOTE:**  
Fabricator to provide Owner with insert template.



END OF SECTION 101423

## **SECTION 102123 - CUBICLES**

### **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. Curtain tracks and carriers.
  - 2. Cubicle and shower curtains.
- B. Related Requirements:
  - 1. Division 06 Section "Miscellaneous Rough Carpentry" for supplementary wood framing and blocking for mounting items requiring anchorage.
  - 2. Division 09 Section "Non-Structural Metal Framing" for supplementary metal framing and blocking for mounting items requiring anchorage.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
  - 1. Include durability, laundry temperature limits, fade resistance, applied curtain treatment, and fire-test-response characteristics for each type of curtain fabric indicated.
  - 2. Include data for each type of track.
- B. Shop Drawings:
  - 1. Show layout and types of cubicles, sizes of curtains, number of carriers, anchorage details, and conditions requiring accessories. Indicate dimensions taken from field measurements.
  - 2. Include details on blocking above ceiling and in walls.
- C. Samples for Initial Selection: For each type of curtain material indicated.

#### **1.4 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: For curtains, track, and hardware to include in operation and maintenance manuals.

## SECTION 102123 - CUBICLES

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Curtains: Provide curtain fabrics with the following characteristics:
  - 1. Launderable to a temperature of not less than 160 deg F.
  - 2. Flame resistant and identical to those that have passed NFPA 701 when tested by a testing and inspecting agency acceptable to authorities having jurisdiction.
    - a. Identify fabrics with appropriate markings of a qualified testing agency.

#### 2.2 CURTAIN SUPPORT SYSTEMS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide the following or approved equal:
  - 1. MFR: InPro Corporation.
  - 2. Model: Ultra Cube
- B. Extruded-Aluminum Curtain Track: Not less than 1-1/4 inches wide by 1-1/8" inch high.
  - 1. Curved Track: Factory-fabricated, 12-inch- radius bends.
  - 2. Finish: White Baked acrylic.
- C. Curtain Track Accessories: Fabricate splices, end caps, connectors, end stops, coupling and joining sleeves, wall flanges, brackets, ceiling clips, and other accessories from same material and with same finish as track.
- D. Curtain Carriers: Two nylon rollers and nylon axle with chrome-plated steel hook.
- E. Curtain Carriers: One-piece nylon glide with chrome-plated steel hook.
- F. Exposed Fasteners: Stainless steel.
- G. Concealed Fasteners: Hot-dip galvanized or stainless steel.

#### 2.3 CURTAINS

- A. Cubicle Curtain Fabric: Curtain manufacturer's standard, 100 percent polyester; inherently and permanently flame resistant, stain resistant, and antimicrobial.
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide the following or approved equal:
    - a. MFR: InPro Corporation.
    - b. Series: Clickeze Priacy Curtains
    - c. Fabric: Gold, Silver or Bronze level
    - d. Color: To be selected from manufacturer's full range.

## SECTION 102123 - CUBICLES

- e. Mesh Top: Not less than 20-inch- high mesh top of No. 50 nylon mesh.
- B. Shower and Tub Curtain Fabric: Curtain manufacturer's standard, polyester-reinforced vinyl fabric; flame resistant, stain resistant, and antimicrobial.
  - 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. Herculite, Inc.; Sure-Chek Linen.
    - b. InPro Corporation; Super Bio-Stat.
  - 2. Color: As selected by ARCHITECT from manufacturer's full range.
- C. Curtain Grommets: Two-piece, rolled-edge, rustproof, nickel-plated brass; spaced not more than 6 inches o.c.; machined into top hem.
- D. Beaded-Chain Curtain Drop: 6 inches long; nickel-plated steel with aluminum hook.
- E. Curtain Tieback: Nickel-plated brass chain; one at each curtain termination.

### 2.4 CURTAIN FABRICATION

- A. Fabricate curtains as follows:
  - 1. Width: Equal to track length from which curtain is hung plus 10 percent added fullness, but not less than 12 inches added fullness.
  - 2. Length: Equal to floor-to-ceiling height, minus depth of track and carrier at top, and minus clearance above the finished floor as follows:
    - a. Shower Curtains: 1/2 inch.
  - 3. Top Hem: Not less than 1 inch and not more than 1-1/2 inches wide, triple thickness, reinforced with integral web, and double lockstitched.
  - 4. Mesh Top: Top hem of mesh not less than 1 inch and not more than 1-1/2 inches wide, triple thickness, reinforced with integral web, and double lockstitched. Double lockstitch bottom of mesh directly to 1/2-inch triple thickness, top hem of curtain fabric.
  - 5. Bottom Hem: Not less than 1 inch and not more than 1-1/2 inches wide, double thickness and single lockstitched.
  - 6. Side Hems: Not less than 1/2 inch and not more than 1-1/4 inches wide, with double turned edges, and single lockstitched.
- B. Vertical Seams: Not less than 1/2 inch wide, double turned and double stitched.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

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

## **SECTION 102123 - CUBICLES**

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 INSTALLATION**

- A. General: Install tracks level and plumb, according to manufacturer's written instructions.
- B. Up to 20 feet in length, provide track fabricated from single, continuous length.
  - 1. Curtain Track Mounting: As indicated on Drawings.
- C. Surface-Track Mounting: Fasten tracks to ceilings at intervals recommended by manufacturer. Fasten tracks to structure at each splice and tangent point of each corner. Center fasteners in track to ensure unencumbered carrier operation. Where not indicated in drawings, attach track to ceiling as follows for applicable condition:
  - 1. Mechanically fasten to furring through suspended ceiling with screw and tube spacer.
- D. Suspended-Track Mounting: Install track with manufacturer's standard tubular aluminum suspended supports at intervals and with fasteners recommended by manufacturer. Fasten supports to structure. Provide supports at each splice and tangent point of each corner. Secure ends of track to wall with flanged fittings or brackets.
- E. Track Accessories: Install splices, end caps, connectors, end stops, coupling and joining sleeves, and other accessories as required for a secure and operational installation.
- F. Curtain Carriers: Provide curtain carriers adequate for 6-inch spacing along full length of curtain plus an additional carrier.
- G. Curtains: Hang curtains on each curtain track. Secure with curtain tieback.

**END OF SECTION 102123**



## **SECTION 102600 - WALL AND DOOR PROTECTION**

### **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. Impact-resistant handrails.
  - 2. Corner guards.
  - 3. Impact-resistant wall coverings.
- B. Related Sections:
  - 1. Division 08 Section "Door Hardware" for metal armor, kick, mop, and push plates.

#### **1.3 PERFORMANCE REQUIREMENTS**

- A. Structural Performance: Provide handrails capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
  - 1. Uniform load of 50 lbf/ft. applied in any direction.
  - 2. Concentrated load of 200 lbf applied in any direction.
  - 3. Uniform and concentrated loads need not be assumed to act concurrently.

#### **1.4 SUBMITTALS**

- A. Product Data: Include construction details, material descriptions, impact strength, dimensions of individual components and profiles, and finishes for each impact-resistant wall protection unit.
- B. Shop Drawings: For each impact-resistant wall protection unit showing locations and extent. Include sections, details, and attachments to other work.
- C. Samples for Initial Selection: For each type of impact-resistant wall protection unit indicated.
  - 1. Include similar Samples of accent strips and accessories involving color selection.
- D. Material Certificates: For each impact-resistant plastic material, from manufacturer.
- E. Material Test Reports: For each impact-resistant plastic material.

## **SECTION 102600 - WALL AND DOOR PROTECTION**

- F. Maintenance Data: For each impact-resistant wall protection unit to include in maintenance manuals.
  - 1. Include recommended methods and frequency of maintenance for maintaining optimum condition of plastic covers under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to plastic finishes and performance.
- G. Warranty: Sample of special warranty.

### **1.5 QUALITY ASSURANCE**

- A. Source Limitations: Obtain impact-resistant wall protection units from single source from single manufacturer.

### **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Store impact-resistant wall protection units in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.
  - 1. Maintain room temperature within storage area at not less than 70 deg F during the period plastic materials are stored.
  - 2. Keep plastic sheet material out of direct sunlight.
  - 3. Store plastic wall protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 70 deg F.
    - a. Store corner-guard covers in a vertical position.
    - b. Store handrail covers in a horizontal position.

### **1.7 PROJECT CONDITIONS**

- A. Environmental Limitations: Do not deliver or install impact-resistant wall protection units until building is enclosed and weatherproof, wet work is complete and dry, and HVAC system is operating and maintaining temperature at 70 deg F for not less than 72 hours before beginning installation and for the remainder of the construction period.

### **1.8 WARRANTY**

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of impact-resistant wall protection units that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures.
    - b. Deterioration of plastic and other materials beyond normal use.

## **SECTION 102600 - WALL AND DOOR PROTECTION**

2. Warranty Period: Five years from date of Substantial Completion.

### **1.9 EXTRA MATERIALS**

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  1. Wall-Guard and Handrail Covers: Full-size plastic covers of maximum length equal to 2 percent of each type, color, and texture of units installed, but no fewer than two, 8-foot-long units.
  2. Corner-Guard Covers: Full-size plastic covers of maximum length equal to 2 percent of each type, color, and texture of units installed, but no fewer than two, 4-foot-long units.
- B. Include mounting and accessory components. Replacement materials shall be from same production run as installed units.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. PVC Plastic: ASTM D 1784, Class 1, textured, chemical- and stain-resistant, high-impact-resistant PVC or acrylic-modified vinyl plastic with integral color throughout; extruded and sheet material, thickness as indicated.
  1. Impact Resistance: Minimum 25.4 ft-lbf/in. of notch when tested according to ASTM D 256, Test Method A.
  2. Chemical and Stain Resistance: Tested according to ASTM D 543.
  3. Self-extinguishing when tested according to ASTM D 635.
  4. Flame-Spread Index: 25 or less.
  5. Smoke-Developed Index: 450 or less.
- B. Fasteners: Aluminum, nonmagnetic stainless-steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with items being fastened. Use security-type fasteners where exposed to view.
- C. Adhesive: As recommended by impact-resistant plastic wall protection manufacturer and with a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

### **2.2 HANDRAILS**

- A. Impact-Resistant Handrails: Assembly consisting of snap-on cover installed over continuous retainer.
  1. Basis-of-Design Product: Subject to compliance with requirements, provide the following approved equal:

## **SECTION 102600 - WALL AND DOOR PROTECTION**

- a. MFR: Construction Specialties, Inc.
  - b. HR-1: Model: HRB-10C
  - c. HR-2: Model: P-0WW
2. Plastic Cover: Minimum 0.078-inch- thick, extruded rigid plastic with pebblette grain texture; as follows:
  - a. Single Handrail: Cylindrical tube profile cover with continuous retainer; with mounting brackets supporting bottom of rail.
    - 1) Tube Diameter: 1-1/2" outside diameter
  - b. Bumper Rail: Cover with flat front side; supported by concealed, continuous retainer and extended mounting brackets.
    - 1) Bumper-Rail Dimensions: 4"
  - c. Color and Texture: As selected by Architect from manufacturer's full range.
3. Wood Handrail: Solid wood as follows:
  - a. Single Handrail: Oval handrail with continuous retainer, with mounting brackets supporting rail.
    - 1) Diameter: Manufacturer standard.
  - b. Crash Rail: Solid wood supported by concealed, continuous retainer and extended mounting brackets.
    - 1) Crash Rail Dimensions : 4"
  - c. Color: As selected by Architect from manufacturer's full range.
4. Retainer: Minimum 0.080-inch- thick, one-piece, extruded aluminum.
5. Mounting Bracket: Extended mounting on anodized-aluminum mounting brackets.
6. End Caps and Corners: Prefabricated, matching color cover; field adjustable for close alignment with snap-on cover.
7. Accessories: Concealed splices, cushions, and mounting hardware.

### **2.3 CORNER GUARDS**

- A. Resilient, Plastic Corner Guards: Assembly consisting of snap-on plastic cover installed over continuous retainer; including mounting hardware; fabricated with 90- or 135-degree turn to match wall condition.
  1. Basis-of-Design Product: Subject to compliance with requirements, provide the following or approved equal:

## SECTION 102600 - WALL AND DOOR PROTECTION

- a. MFR: Construction Specialties, Inc.
    - b. Model: SM-20
  2. Cover: Extruded rigid plastic, minimum 0.078-inch wall thickness;
    - a. Profile: Nominal 3-inch- long leg and 1/4-inch corner radius.
    - b. Height: 8 feet.
    - c. Color and Texture: As selected by Architect from manufacturer's full range.
  3. Retainer: Minimum 0.060-inch- thick, one-piece, extruded aluminum.
  4. Retainer Clips: Manufacturer's standard impact-absorbing clips.
  5. Top and Bottom Caps: Prefabricated, injection-molded plastic; color matching cover; field adjustable for close alignment with snap-on cover.
- B. Fire-Rated, Resilient, Plastic Corner Guards: Assembly consisting of snap-on plastic cover that is flush with adjacent wall surface, installed over continuous retainer and intumescent fire barrier; including mounting hardware; fabricated with 90- or 135-degree turn to match wall condition; full wall height.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Arden Architectural Specialties, Inc.
    - b. Balco, Inc.
    - c. Construction Specialties, Inc.
    - d. IPC Door and Wall Protection Systems; Division of InPro Corporation.
    - e. Pawling Corporation.
  2. Fire Rating: Same rating as wall in which corner guard is installed; UL listed and labeled according to UL 2079.
  3. Cover: Extruded rigid plastic, minimum 0.078-inch wall thickness; as follows:
    - a. Leg: Nominal 3 inches.
    - b. Corner Radius: 1/4 inch.
    - c. Color and Texture: As selected by Architect from manufacturer's full range.
  4. Retainer: Minimum 0.070-inch- thick, one-piece, extruded aluminum.
  5. Aluminum Cove Base: Nominal 4 inches or 6 inches high.

### 2.4 IMPACT-RESISTANT WALL COVERINGS

- A. Impact-Resistant Sheet Wall Covering: Fabricated from plastic sheet wall-covering material.
1. Basis-of-Design Product: Subject to compliance with requirements, provide the following or approved equal:
    - a. MFR: Construction Specialties, Inc.
    - b. WC1: Rigid vinyl sheet, pebblette grain texture
    - c. WC2: Rigid vinyl sheet, Chameleon simulated wood pattern
  2. Size: Manufacturer standard.

## **SECTION 102600 - WALL AND DOOR PROTECTION**

3. Sheet Thickness: 0.040 inch.
4. Color and Texture: As selected by ARCHITECT from manufacturer's full range.
5. Height: As indicated.
6. Trim and Joint Moldings: Extruded rigid plastic that matches sheet wall covering color.
7. Mounting: Adhesive.

### **2.5 FABRICATION**

- A. Fabricate impact-resistant wall protection units to comply with requirements indicated for design, dimensions, and member sizes, including thicknesses of components.
- B. Assemble components in factory to greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.
- C. Fabricate components with tight seams and joints with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.

### **2.6 METAL FINISHES**

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
  1. Remove tool and die marks and stretch lines, or blend into finish.
  2. Grind and polish surfaces to produce uniform finish, free of cross scratches.
  3. Run grain of directional finishes with long dimension of each piece.
  4. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
- B. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances, fire rating, and other conditions affecting performance of work.
- B. Examine walls to which impact-resistant wall protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.
  1. For impact-resistant wall protection units attached with adhesive or foam tape, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

## **SECTION 102600 - WALL AND DOOR PROTECTION**

- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 PREPARATION**

- A. Complete finishing operations, including painting, before installing impact-resistant wall protection system components.
- B. Before installation, clean substrate to remove dust, debris, and loose particles.

### **3.3 INSTALLATION**

- A. General: Install impact-resistant wall protection units level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.
  - 1. Install impact-resistant wall protection units in locations and at mounting heights indicated on Drawings.
  - 2. Provide splices, mounting hardware, anchors, and other accessories required for a complete installation.
    - a. Provide anchoring devices to withstand imposed loads.
    - b. Where splices occur in horizontal runs of more than 20 feet, splice aluminum retainers and plastic covers at different locations along the run, but no closer than 12 inches.
    - c. Adjust end and top caps as required to ensure tight seams.
- B. Impact-Resistant Wall Covering: Install top and edge moldings, corners, and divider bars as required for a complete installation.

### **3.4 CLEANING**

- A. Immediately after completion of installation, clean plastic covers and accessories using a standard, ammonia-based, household cleaning agent.
- B. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

**END OF SECTION 102600**

## **SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section Includes:
  - 1. Washroom accessories.
  - 2. Shower room accessories.
  - 3. Bathroom accessories.
  - 4. Childcare accessories.
  - 5. Underlavatory guards.

#### **1.3 SUBMITTALS**

- A. Product Data: For each type of product indicated. Include the following:
  - 1. Construction details and dimensions.
  - 2. Anchoring and mounting requirements, including requirements for cutouts in other WORK and substrate preparation.
  - 3. Material and finish descriptions.
  - 4. Features that will be included for Project.
  - 5. Manufacturer's warranty.
- B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
  - 1. Identify locations using room designations indicated.
  - 2. Identify products using designations indicated.
- C. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.
- D. Warranty: Sample of special warranty.

#### **1.4 QUALITY ASSURANCE**

- A. Source Limitations: For products listed together in the same Part 2 articles, obtain products from single source from single manufacturer.
- 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.



## **SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES**

### **1.5 COORDINATION**

- A. Coordinate accessory locations with other WORK to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the WORK.

### **1.6 WARRANTY**

- A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or WORKmanship within specified warranty period.

- 1. Warranty Period: 15 years from date of Substantial Completion.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch minimum nominal thickness unless otherwise indicated.
- B. Brass: ASTM B 19, flat products; ASTM B 16/B 16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.
- C. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch minimum nominal thickness.
- D. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating.
- E. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- F. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.
- G. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).
- H. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.
- I. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

## **SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES**

### **2.2 WASHROOM ACCESSORIES**

- 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. A & J Washroom Accessories, Inc.
  2. American Specialties, Inc.
  3. Bobrick Washroom Equipment, Inc.
  4. Bradley Corporation.
  5. GAMCO Specialty Accessories; a division of Bobrick Washroom Equipment, Inc.
  6. Tubular Specialties Manufacturing, Inc.
- B. Toilet Tissue (Roll) Dispenser – TPD:
1. Basis-of-Design Product, provide the following or approved equal:
    - a. TPD1: Bradley Model 5412.
    - b. TPD2: Bradley Model 5124.
  2. Description: Roll-in-reserve dispenser with hinged front secured with tumbler lockset; Double-roll dispenser.
  3. Mounting: As indicated.
  4. Operation: Noncontrol delivery with standard spindle.
  5. Capacity: Designed for 4-1/2- or 5-inch- diameter tissue rolls.
  6. Material and Finish: Stainless steel, No. 4 finish (satin).
- C. Paper Towel (Folded) Dispenser - PTD:
1. Basis-of-Design Product, provide the following or approved equal:
    - a. MFR: Georgia Pacific
    - b. Series: enMotion Recessed Automated Touchless Towel Dispenser
    - c. Model: 59466
  2. Mounting: Recessed.
  3. Minimum Capacity: Manufacturer standard.
  4. Material and Finish: Stainless steel, No. 4 finish (satin).
  5. Power Option: AC Power Adapter
- D. Waste Receptacle - WR:
1. Basis-of-Design Product, provide the following or approved equal:
    - a. MFR: Bradley
    - b. Model 346 Recessed.
  2. Mounting: Open top, recessed.
  3. Minimum Capacity: 12 gal.
  4. Material and Finish: Stainless steel, No. 4 finish (satin).

## **SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES**

5. Liner: Reusable vinyl liner.
6. Lockset: Tumbler type for waste-receptacle.

### **E. Grab Bar – GB :**

1. Basis-of-Design Product, provide the following or approved equal:
  - a. MFR: Bradley
  - b. Model: 812
2. Mounting: Flanges with concealed fasteners.
3. Material: Stainless steel, 0.05 inch thick.
  - a. Finish: Smooth, No. 4 finish (satin) on ends and safety grip texture in grip area.
4. Outside Diameter: 1-1/2 inches.
5. Configuration and Length: As indicated on Drawings

### **F. Swing-Away Grab Bar:**

1. Basis-of Design Product, provide the following or approved equal:
  - a. MFR: Bradley
  - b. Swing Away Grab Bar A: Model 8170-158
  - c. Swing Away Grab Bar B: Model 8170-158-1 (with integral tissue dispenser)
2. Material: Stainless steel, 0.05 inch thick
3. Outside Diameter: 1-1/2 inches.
4. Wall Flanges: 3/16" thick stainless steel with exposed surfaces in ARCHITECTural satin finish.

### **G. Sanitary-Napkin Disposal Unit - SND:**

1. Basis-of-Design Product, provide the following or approved equal:
  - a. MFR: Bradley
  - b. Model 4722-10-15
2. Mounting: Semi-recessed.
3. Door or Cover: Self-closing, disposal-opening cover and hinged face panel with tumbler lockset.
4. Receptacle: Removable.
5. Material and Finish: Stainless steel, No. 4 finish (satin)
6. Capacity: 1.5 gal.

### **H. Seat-Cover Dispenser - SCD:**

1. Basis-of-Design Product, provide the following or approved equal:
  - a. MFR: Bradley
  - b. Model 5831

## **SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES**

2. Mounting: Surface mounted.
3. Minimum Capacity: 250 seat covers.
4. Exposed Material and Finish: Stainless steel, No. 4 finish (satin).
5. Lockset: Tumbler type.

### **I. Mirror Unit- Mirror: :**

1. Basis-of-Design Product, provide the following or approved equal:
  - a. MFR: Bradley
  - b. Model: 780
2. Frame: Stainless-steel angle, 0.05 inch thick.
  - a. Corners: Manufacturer's standard.
3. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.
  - a. One-piece, galvanized-steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
  - b. Wall bracket of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.
4. Size: As indicated on Drawings.

## **2.3 SHOWER ROOM ACCESSORIES**

- 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. A & J Washroom Accessories, Inc.
  2. American Specialties, Inc.
  3. Bobrick Washroom Equipment, Inc.
  4. Bradley Corporation.
  5. GAMCO Specialty Accessories; a division of Bobrick Washroom Equipment, Inc.
  6. Tubular Specialties Manufacturing, Inc.
- B. Shower Curtain Rod:
  1. Description: 1-inch OD; fabricated from nominal 0.0375-inch- thick stainless steel.
  2. Mounting Flanges: Stainless-steel flanges designed for exposed fasteners.
  3. Finish: No. 4 (satin).
- C. Shower Curtain:
  1. Size: Minimum 6 inches wider than opening by 72 inches high.
  2. Material: Vinyl, minimum 0.006 inch thick, opaque, matte.
  3. Color: As selected from manufacturer's full range.
  4. Grommets: Corrosion resistant at minimum 6 inches o.c. through top hem.

## **SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES**

5. Shower Curtain Hooks: Chrome-plated or stainless-steel, spring wire curtain hooks with snap fasteners, sized to accommodate specified curtain rod. Provide one hook per curtain grommet.

### **D. Folding Shower Seat – Bariatric Shower Seat:**

1. Basis-of-Design Product, provide the following or approved equal:
  - a. MFR: Bradley
  - b. Model: 958 Bench Style Bariatric Shower Seat
2. Configuration: Rectangular seat.
3. Seat: Phenolic or polymeric composite of slat-type or one-piece construction.
4. Mounting Mechanism: Stainless steel, No. 4 finish (satin).
5. Dimensions: 32"x15", adjustable height.

### **E. Shelf:**

1. Basis-of-Design Product, provide the following or approved equal:
  - a. MFR: Bradley
  - b. Model: SA49 Security Shelf
2. Description: All welds ground smooth, with polished corners and burr-free edges.
3. Size: As indicated.
4. Material and Finish: Not less than nominal 0.05-inch- thick stainless steel, No. 4 finish (satin).

## **2.4 BATHROOM ACCESSORIES**

### **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. Basco, Inc.
2. Bobrick Washroom Equipment, Inc.
3. Franklin Brass by Liberty Hardware Manufacturing Corporation; a Masco company.
4. GAMCO Specialty Accessories; a division of Bobrick Washroom Equipment, Inc.
5. Ginger; a Masco company.
6. Seachrome Corporation.
7. Tubular Specialties Manufacturing, Inc.

### **B. Robe Hook:**

1. Basis-of-Design Product, provide the following or approved equal:
  - a. MFR: Bradley
  - b. Model: SA35
2. Description: Single-prong unit.

## **SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES**

3. Safety Hook: Stainless steel with pivoting ball joint that release when more than 20 lbs. of force is applied.
4. Backplate: 14 ga stainless steel with exposed surfaces in ARCHITECTural satin finish. All seams welded and ground smooth.
5. Material and Finish: Stainless steel, No. 4 finish (satin).

### **2.5 CHILDCARE ACCESSORIES**

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the WORK include, but are not limited to, the following:

1. American Specialties, Inc.
2. Brocar Products, Inc.
3. Diaper Deck & Company, Inc.
4. GAMCO Specialty Accessories; a division of Bobrick Washroom Equipment, Inc.
5. Koala Kare Products; a division of Bobrick Washroom Equipment, Inc.
6. SSC, Inc.
7. Tubular Specialties Manufacturing, Inc.

- B. Diaper-Changing Station:

1. Basis-of-Design Product, provide the following or approved equal:
  - a. MFR: Bradley
  - b. Model: 9612-Ivory
2. Description: Horizontal unit that opens by folding down from stored position and with child-protection strap.
  - a. Engineered to support a minimum of 250-lb static load when opened.
3. Mounting: Surface mounted, with unit projecting not more than 4 inches from wall when closed.
4. Operation: By pneumatic shock-absorbing mechanism.
5. Material and Finish: HDPE in manufacturer's standard color.
6. Liner Dispenser: Built in.

### **2.6 UNDERLAVATORY GUARDS**

- 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. Plumberex Specialty Products, Inc.
2. Truebro by IPS Corporation.

## **SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES**

### **B. Underlavatory Guard:**

1. Description: Insulating pipe covering for supply and drain piping assemblies that prevent direct contact with and burns from piping; allow service access without removing coverings.
2. Material and Finish: Antimicrobial, molded plastic, white.

### **2.7 FABRICATION**

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to OWNER'S representative.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F 446.

### **3.2 ADJUSTING AND CLEANING**

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

**END OF SECTION 102800**

## **SECTION 104413 - FIRE EXTINGUISHER CABINETS**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section Includes:
  - 1. Fire protection cabinets for the following:
    - a. Portable fire extinguishers.

#### **1.3 SUBMITTALS**

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire protection cabinets.
  - 1. Fire Protection Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.
- B. Product Schedule: For fire protection cabinets. Coordinate final fire protection cabinet schedule with fire extinguisher schedule to ensure proper fit and function.
- C. Maintenance Data: For fire protection cabinets to include in maintenance manuals.

#### **1.4 QUALITY ASSURANCE**

- A. Fire-Rated, Fire Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.

#### **1.5 COORDINATION**

- A. Coordinate size of fire protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.
- B. Coordinate sizes and locations of fire protection cabinets with wall depths.



## **SECTION 104413 - FIRE EXTINGUISHER CABINETS**

### **1.6 SEQUENCING**

- A. Apply any decals or vinyl lettering on field-painted, fire protection cabinets after painting is complete if applicable.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
- B. Stainless-Steel Sheet: ASTM A 666, Type 304.

### **2.2 FIRE PROTECTION CABINET – FEC:**

- A. Basis of Design: Suitable for fire extinguisher, provide the following or approved equal:
  - 1. Mfr: Larsen's Manufacturing Company
  - 2. Series: ARCHITECTural
  - 3. Model No.: SS 2409-R3
  - 4. Door Style: Solid door with vertical engraved letters
- B. Cabinet Construction: Fire rated cabinets installed in rated partitions; non rated cabinets in non-rated partitions.
  - 1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.0428-inch- thick, cold-rolled steel sheet lined with minimum 5/8-inch- thick, fire-barrier material. Provide factory-drilled mounting holes.
- C. Cabinet Material: Steel sheet.
  - 1. Shelf: Same metal and finish as cabinet.
- D. Semirecessed Cabinet: Cabinet box partially recessed in walls of sufficient depth to suit style of trim indicated; with one-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend). Provide where walls are of insufficient depth for recessed cabinets but are of sufficient depth to accommodate semirecessed cabinet installation.
  - 1. Rolled-Edge Trim: 2-1/2-inch backbend depth.
- E. Cabinet Trim Material: Stainless steel.
- F. Door Material: Stainless-steel sheet.
- G. Door Style: Flush opaque panel, frameless, with no exposed hinges.
- H. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

## **SECTION 104413 - FIRE EXTINGUISHER CABINETS**

### **I. Accessories:**

1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
2. Door Lock: Cam lock that allows door to be opened during emergency by pulling sharply on door handle.
  - a. Identify fire extinguisher in fire protection cabinet with the words "FIRE EXTINGUISHER."
    - 1) Location: Applied to cabinet door.
    - 2) Application Process: Engraved.
    - 3) Orientation: Vertical.

### **J. Finishes:**

1. Stainless Steel: No. 4.

## **2.3 FABRICATION**

- A. Fire Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
- B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles selected.
- C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

## **2.4 GENERAL FINISH REQUIREMENTS**

- A. Comply with NAAMM's "Metal Finishes Manual for ARCHITECTural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces of fire protection cabinets from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished WORK: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## **SECTION 104413 - FIRE EXTINGUISHER CABINETS**

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Examine roughing-in for cabinets to verify actual locations of piping connections before cabinet installation.
- B. Examine walls and partitions for suitable framing depth and blocking where semirecessed cabinets will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### **3.2 PREPARATION**

- A. Prepare recesses for semirecessed fire protection cabinets as required by type and size of cabinet and trim style.

#### **3.3 INSTALLATION**

- A. General: Install fire protection cabinets in locations and at mounting heights indicated or, at heights acceptable to authorities having jurisdiction.
- B. Fire Protection Cabinets: Fasten cabinets to structure, square and plumb.
  - 1. Unless otherwise indicated, provide recessed fire protection cabinets. If wall thickness is not adequate for recessed cabinets, provide semirecessed fire protection cabinets.
  - 2. Fasten mounting brackets to inside surface of fire protection cabinets, square and plumb.

#### **3.4 ADJUSTING AND CLEANING**

- A. Remove temporary protective coverings and strippable films, if any, as fire protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust fire protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- C. On completion of fire protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- D. Touch up marred finishes, or replace fire protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire protection cabinet and mounting bracket manufacturers.
- E. Replace fire protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

**END OF SECTION 104413**

**BRH MEDICAL SURGICAL EAST WING RENOVATIONS**

**CBJ Contract No. E10-221**

**FIRE EXTINGUISHER  
CABINETS  
104413 - 4**

## **SECTION 104416 - FIRE EXTINGUISHERS**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section includes portable, fire extinguishers and mounting brackets for fire extinguishers.
- B. Related Sections:
  - 1. Division 10 Section "Fire Extinguisher Cabinets."

#### **1.3 SUBMITTALS**

- A. Product Data: For each type of product indicated. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.
- B. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.
- C. Warranty: Sample of special warranty.

#### **1.4 QUALITY ASSURANCE**

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

#### **1.5 COORDINATION**

- A. Coordinate type and capacity of fire extinguishers with fire protection cabinets to ensure fit and function.

#### **1.6 WARRANTY**

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or WORKmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Failure of hydrostatic test according to NFPA 10.

## **SECTION 104416 - FIRE EXTINGUISHERS**

- b. Faulty operation of valves or release levers.
- 2. Warranty Period: Six years from date of Substantial Completion.

### **PART 2 - PRODUCTS**

#### **2.1 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS**

- A. Fire Extinguishers: Type, size, and capacity for each fire protection cabinet and mounting bracket indicated.
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide the following or comparable product compatible with fire extinguisher cabinet:
    - a. MFR: Larsen's Manufacturing Company.
    - b. Model: MP5
  - 2. Valves: Manufacturer's standard.
  - 3. Handles and Levers: Manufacturer's standard.
  - 4. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B and bar coding for documenting fire extinguisher location, inspections, maintenance, and recharging.
- B. Multipurpose Dry-Chemical Type: UL-rated nominal capacity, with mono ammonium phosphate-based dry chemical in manufacturer's standard enameled container.

#### **2.2 MOUNTING BRACKETS**

- A. Mounting Brackets: Manufacturer's standard steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, compatible with cabinets and extinguishers.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Examine fire extinguishers for proper charging and tagging.
  - 1. Remove and replace damaged, defective, or undercharged fire extinguishers.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### **3.2 INSTALLATION**

- A. General: Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.

## **SECTION 104416 - FIRE EXTINGUISHERS**

- B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

**END OF SECTION 104416**

## **SECTION 113100 - RESIDENTIAL APPLIANCES**

### **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. Electric fireplace.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, dimensions, furnished accessories, and finishes for each appliance.
- B. Samples: For each exposed product and for each color and texture specified, in manufacturer's standard size.
- C. Product Schedule: For appliances. Use same designations indicated on Drawings.

#### **1.4 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: For each residential appliance to include in operation and maintenance manuals.

#### **1.5 QUALITY ASSURANCE**

- A. Regulatory Requirements: Comply with the following:
  - 1. NFPA: Provide electrical appliances listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

#### **1.6 WARRANTY**

- A. Special Warranties: Manufacturer's standard form in which manufacturer agrees to repair or replace residential appliances or components that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: Five years from date of Substantial Completion.

## **SECTION 113100 - RESIDENTIAL APPLIANCES**

### **PART 2 - PRODUCTS**

#### **2.1 ELECTRIC FIREPLACE**

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated or comparable product.
  - 1. MFR: Dimplex North America Limited 1-800-668-6663
  - 2. Model: Chilton Electric Fireplace SOP-295-E
  - 3. Finish: Espresso
  - 4. Electrical Requirements: 120 V
  - 5. Dimensions: 54"Wx23-3/16"Dx45-1/2"H

#### **2.2 GENERAL FINISH REQUIREMENTS**

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished WORK: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, power connections, and other conditions affecting installation and performance of residential appliances.
- B. Examine walls, ceilings, and roofs for suitable conditions where fireplace will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### **3.2 INSTALLATION, GENERAL**

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



## **SECTION 113100 - RESIDENTIAL APPLIANCES**

### **3.3 FIELD QUALITY CONTROL**

#### **A. Tests and Inspections:**

1. Perform visual, and electrical inspection and testing for each appliance according to manufacturers' written recommendations. Certify compliance with each manufacturer's appliance-performance parameters.
2. Operational Test: After installation, start units to confirm proper operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and components.

#### **B. An appliance will be considered defective if it does not pass tests and inspections.**

**END OF SECTION 113100**

## **SECTION 122113 - HORIZONTAL LOUVER BLINDS**

### **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. Horizontal louver blinds with aluminum slats.

- B. Related Requirements:

- 1. Division 06 Section "Miscellaneous Rough Carpentry" for wood blocking and grounds for mounting horizontal louver blinds and accessories.

#### **1.3 ACTION SUBMITTALS**

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

- B. Samples for Initial Selection: For each type and color of horizontal louver blind.

- 1. Include similar Samples of accessories involving color selection.

- C. Window-Treatment Schedule: For horizontal louver blinds. Use same designations indicated on Drawings.

#### **1.4 INFORMATIONAL SUBMITTALS**

- A. Product Certificates: For each type of horizontal louver blind.

#### **1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver horizontal louver blinds in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

#### **1.6 FIELD CONDITIONS**

- A. Environmental Limitations: Do not install horizontal louver blinds until construction and wet and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

## **SECTION 122113 - HORIZONTAL LOUVER BLINDS**

- B. Field Measurements: Where horizontal louver blinds are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

### **PART 2 - PRODUCTS**

#### **2.1 MANUFACTURERS**

- A. Source Limitations: Obtain horizontal louver blinds from single source from single manufacturer.

#### **2.2 HORIZONTAL LOUVER BLINDS, ALUMINUM SLATS**

- A. Basis-of-Design Product: Subject to compliance with requirements, provide the following or approved equal:
  - 1. Levolor Contract
  - 2. Cordless Mark I Light Master series
- B. Slats: Aluminum; alloy and temper recommended by producer for type of use and finish indicated; with crowned profile and radius corners.
  - 1. Width: 1 inch.
  - 2. Thickness: Not less than 0.008 inch.
  - 3. Spacing: Manufacturer's standard.
  - 4. Finish: Ionized antistatic, dust-repellent, baked polyester finish.
  - 5. Features:
- C. Headrail: Formed steel long edges returned or rolled. Headrails fully enclose operating mechanisms on three sides.
  - 1. Capacity: One blind per headrail unless otherwise indicated.
  - 2. Ends: Manufacturer's standard.
  - 3. Manual Lift Mechanism: Raise and lower with touch of the hands.
  - 4. Manual Tilt Mechanism: Enclosed worm-gear mechanism and linkage rod that adjusts ladders.
    - a. Operator: Clear-plastic wand.
- D. Bottom Rail: Formed-steel or extruded-aluminum tube that secures and protects ends of ladders and lift cords and has plastic- or metal-capped ends.
  - 1. Type: Manufacturer's standard.

## **SECTION 122113 - HORIZONTAL LOUVER BLINDS**

- E. Ladders: Evenly spaced across headrail at spacing that prevents long-term slat sag.
  - 1. Type: Braided cord.
- F. Mounting Brackets: With spacers and shims required for blind placement and alignment indicated.
  - 1. Type: As indicated.
  - 2. Intermediate Support: Provide intermediate support brackets to produce support spacing recommended by blind manufacturer for weight and size of blind.
- G. Hold-Down Brackets and Hooks or Pins: Manufacturer's standard.
- H. Side Channels and Perimeter Light Gap Seals: Manufacturer's standard.
- I. Colors, Textures, Patterns, and Gloss:
  - 1. Slats: As selected by Architect from manufacturer's full range.
  - 2. Components: Provide rails, cords, ladders, and materials exposed to view matching or coordinating with slat color unless otherwise indicated.

### **2.3 HORIZONTAL LOUVER BLIND FABRICATION**

- A. Product Safety Standard: Fabricate horizontal louver blinds to comply with WCMA A 100.1 including requirements for corded, flexible, looped devices; lead content of components; and warning labels.
- B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F:
  - 1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which blind is installed less 1/4 inch per side or 1/2 inch total, plus or minus 1/8 inch. Length equal to head-to-sill dimension of opening in which blind is installed less 1/4 inch, plus or minus 1/8 inch.
- C. Concealed Components: Noncorrodible or corrosion-resistant-coated materials.
  - 1. Lift-and-Tilt Mechanisms: With permanently lubricated moving parts.
- D. Mounting and Intermediate Brackets: Designed for removal and reinstallation of blind without damaging blind and adjacent surfaces, for supporting blind components, and for bracket positions and blind placement indicated.
- E. Installation Fasteners: No fewer than two fasteners per bracket, fabricated from metal noncorrosive to brackets and adjoining construction; type designed for securing to supporting substrate; and supporting blinds and accessories under conditions of normal use.
- F. Color-Coated Finish:

## **SECTION 122113 - HORIZONTAL LOUVER BLINDS**

1. Metal: For components exposed to view, apply manufacturer's standard baked finish complying with manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance.
  1. Proceed with installation only after unsatisfactory conditions have been corrected.

#### **3.2 INSTALLATION**

- A. Install horizontal louver blinds level and plumb, aligned and centered on openings, and aligned with adjacent units according to manufacturer's written instructions.
  1. Install mounting and intermediate brackets to prevent deflection of headrails.
  2. Install with clearances that prevent interference with adjacent blinds, adjacent construction, and operating hardware of glazed openings, other window treatments, and similar building components and furnishings.

#### **3.3 ADJUSTING**

- A. Adjust horizontal louver blinds to operate free of binding or malfunction through full operating ranges.

#### **3.4 CLEANING AND PROTECTION**

- A. Clean horizontal louver blind surfaces after installation according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions in a manner acceptable to manufacturer and Installer and that ensures that horizontal louver blinds are without damage or deterioration at time of Substantial Completion.
- C. Replace damaged horizontal louver blinds that cannot be repaired in a manner approved by Architect before time of Substantial Completion.

**END OF SECTION 122113**

## **SECTION 122413 - ROLLER WINDOW SHADES**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section Includes:

- 1. Manually operated roller shades with double rollers.

- B. Related Requirements:

- 1. Division 06 Section "Miscellaneous Rough Carpentry" for wood blocking and grounds for mounting roller shades and accessories.
  - 2. Division 07 Section "Joint Sealants" for sealing the perimeters of installation accessories for light-blocking shades with a sealant.

#### **1.3 ACTION SUBMITTALS**

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

- 1. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.

- B. Samples for Initial Selection: For each type and color of shadeband material.

- 1. Include Samples of accessories involving color selection.

#### **1.4 CLOSEOUT SUBMITTALS**

- A. Maintenance Data: For roller shades 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. Roller Shades: Full-size units equal to 5 percent of quantity installed for each size, color, and shadeband material indicated, but no fewer than two units.

## **SECTION 122413 - ROLLER WINDOW SHADES**

### **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

### **1.7 FIELD CONDITIONS**

- A. Environmental Limitations: Do not install roller shades until construction and finish WORK in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify ARCHITECT of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the WORK.

### **1.8 QUALITY ASSURANCE**

- A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
  - 1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless ARCHITECT specifically approves such deviations in writing.
  - 2. Subject to compliance with requirements, approved mockups may become part of the completed WORK if undisturbed at time of Substantial Completion.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Basis-of-Design Product: Subject to compliance with requirements, provide the following:
  - 1. MFR: Solarfective Products Limited
  - 2. Series: Teleshade
  - 3. System: T-9 Double 6 in. Manual Teleshade System
- B. Source Limitations: Obtain roller shades and fabric from single source from single manufacturer.

### **2.2 MANUALLY OPERATED SHADES WITH DOUBLE ROLLERS**

- A. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.

## SECTION 122413 - ROLLER WINDOW SHADES

1. Bead Chains: Manufacturer's standard.
  - a. Limit Stops: Provide upper and lower ball stops.
  - b. Chain-Retainer Type: Manufacturer standard.
- B. Spring Operating Mechanisms: Roller contains spring sized to accommodate shade size indicated. Provide with positive locking mechanism that can stop shade movement at each half-turn of roller and with manufacturer's standard pull.
- C. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
  1. Double-Roller Mounting Configuration: Offset, outside roller over and inside roller under.
  2. Inside Roller:
    - a. Drive-End Location: Right side of inside face of shade.
    - b. Direction of Shadeband Roll: Regular, from back of roller.
  3. Outside Roller:
    - a. Drive-End Location: Right side of inside face of shade.
    - b. Direction of Shadeband Roll: Regular, from back of roller.
  4. Shadeband-to-Roller Attachment: Manufacturer's standard method.
- D. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller mounting configuration, roller assemblies, operating mechanisms, installation accessories, and installation locations and conditions indicated.
- E. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers into a multiband shade that is operated by one roller drive-end assembly.
- F. Inside Shadebands:
  1. Shadeband Material: Light-filtering fabric.
  2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
    - a. Type: Enclosed in sealed pocket of shadeband material.
    - b. Color and Finish: As selected by ARCHITECT from manufacturer's full range.
- G. Outside Shadebands:
  1. Shadeband Material: Light-blocking fabric.
  2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
    - a. Type: Enclosed in sealed pocket of shadeband material.
    - b. Color and Finish: As selected by ARCHITECT from manufacturer's full range .
- H. Installation Accessories:



## **SECTION 122413 - ROLLER WINDOW SHADES**

1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.
  - a. Shape: L-shaped.
  - b. Height: Manufacturer's standard height required to conceal roller and shadeband when shade is fully open, but not less than 4 inches.
2. Endcap Covers: To cover exposed endcaps.

### **2.3 SHADEBAND MATERIALS**

- A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- B. Light-Filtering Fabric: Woven fabric, stain and fade resistant.
  1. Source: Roller-shade manufacturer.
  2. Type: PVC-coated fiberglass.
  3. Weave: Mesh.
- C. Light-Blocking Fabric: Opaque fabric, stain and fade resistant.
  1. Source: Roller-shade manufacturer.
  2. Type: Fiberglass textile with PVC film bonded to both sides.

### **2.4 ROLLER-SHADE FABRICATION**

- A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.
- B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F:
  1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed less 1/4 inch per side or 1/2-inch total, plus or minus 1/8 inch. Length equal to head-to-sill or -floor dimension of opening in which shade is installed less 1/4 inch, plus or minus 1/8 inch.
- C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible except as follows:
  1. Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than 1:4, provide battens and seams at uniform spacings along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion of the material.

## **SECTION 122413 - ROLLER WINDOW SHADES**

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

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

#### **3.2 ROLLER-SHADE INSTALLATION**

- A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.

#### **3.3 ADJUSTING**

- A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

#### **3.4 CLEANING AND PROTECTION**

- A. Clean roller-shade surfaces after installation, according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.
- C. Replace damaged roller shades that cannot be repaired, in a manner approved by ARCHITECT, before time of Substantial Completion.

### **END OF SECTION 122413**

## **SECTION 123550 - INSTITUTIONAL CASEWORK**

### **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 the following:
  - 1. Plastic-laminate-faced wood cabinets of stock design.
  - 2. Solid-surfacing-material countertops.
- B. Related Sections include the following:
  - 1. Division 6 Section "Miscellaneous Rough Carpentry" for wood blocking for anchoring institutional casework.
  - 2. Division 9 Section "Gypsum Board Assemblies" for reinforcements in gypsum board partitions for anchoring institutional casework.
  - 3. Division 9 Section "Resilient Wall Base and Accessories" for resilient base applied to institutional casework.

#### **1.3 DEFINITIONS**

- A. Exposed Portions of Cabinets: Surfaces visible when doors and drawers are closed, including bottoms of cabinets more than 48 inches above floor, and surfaces visible in open cabinets.
- B. Semiexposed Portions of Cabinets: Surfaces behind opaque doors, such as interiors of cabinets, shelves, dividers, interiors and sides of drawers, and interior faces of doors. Tops of cases 78 inches or more above floor are defined as semiexposed.
- C. Concealed Portions of Cabinets: Surfaces not usually visible after installation, including sleepers, web frames, dust panels, and ends and backs that are placed directly against walls or other cabinets.

#### **1.4 SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication and installation details for institutional casework. Include plans, elevations, sections, details, and attachments to other WORK.
- C. Samples for Initial Selection: For cabinet finishes and for each type of top material indicated.

## **SECTION 123550 - INSTITUTIONAL CASEWORK**

### **1.5 QUALITY ASSURANCE**

- A. Source Limitations: Obtain institutional casework through one source from a single manufacturer.
- B. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards," Section 1600.

### **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver institutional casework only after painting, utility roughing-in, and similar operations that could damage, soil, or deteriorate casework have been completed in installation areas. If casework must be stored in other than installation areas, store only in areas where environmental conditions meet requirements specified in "Project Conditions" Article.
- B. Keep finished surfaces covered with polyethylene film or other protective covering during handling and installation.

### **1.7 PROJECT CONDITIONS**

- A. Environmental Limitations: Do not deliver or install institutional casework until building is enclosed, wet WORK is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Where institutional casework is indicated to fit to other construction, verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings.
  - 1. Established Dimensions: Where field measurements cannot be made without delaying the WORK, establish dimensions and proceed with fabricating institutional casework without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions.

### **1.8 COORDINATION**

- A. Coordinate layout and installation of metal framing and reinforcements in gypsum board assemblies for support of institutional casework.

### **1.9 WARRANTY**

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of institutional casework that fail in materials or WORKmanship within specified warranty period. Failures include, but are not limited to, the following:
  - 1. Delamination of components or other failures of glue bond.
  - 2. Warping of components.
  - 3. Failure of operating hardware.
  - 4. Deterioration of finishes.

## **SECTION 123550 - INSTITUTIONAL CASEWORK**

- B. Warranty Period: Five years from date of Substantial Completion.

### **PART 2 - PRODUCTS**

#### **2.1 MANUFACTURERS**

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the WORK include, but are not limited to, the following:

1. Plastic-Laminate-Faced Institutional Casework:
  - a. Architectural Cabinet Systems; Division of Windham Millwork, Inc.
  - b. Case Systems, Inc.
  - c. Fisher Hamilton Inc.
  - d. Hausmann Industries, Inc.
  - e. LSI Corporation of America, Inc.
  - f. Norlab, Inc.
  - g. techline.
  - h. Terrill Manufacturing Company.
  - i. TMI Systems Design Corp.
2. Plastic-Laminate Material:
  - a. Formica Corporation.
  - b. International Paper; Decorative Products Div.
  - c. Laminart.
  - d. Wilsonart International; Div. of Premark International, Inc.
3. Solid-Surfacing Material:
  - a. Avonite, Inc.
  - b. DuPont Polymers.
  - c. Formica Corporation.
  - d. International Paper; Decorative Products Div.
  - e. Wilsonart International; Div. of Premark International, Inc.

#### **2.2 MATERIALS**

- A. General:
1. Maximum Moisture Content for Lumber: 7 percent for hardwood and 12 percent for softwood.
  2. Hardwood Plywood: HPVA HP-1, either veneer core or particle core, unless otherwise indicated.
  3. Softwood Plywood: DOC PS 1.
  4. Particleboard: ANSI A208.1, Grade M-2-Exterior Glue.
  5. Medium-Density Fiberboard: ANSI A208.2, Grade MD-Exterior Glue.
  6. Hardboard: AHA A135.4, Class 1 Tempered.

## SECTION 123550 - INSTITUTIONAL CASEWORK

7. Plastic Laminate: High-pressure decorative laminate complying with NEMA LD 3.
8. Edgebanding for Plastic Laminate: Rigid PVC T-molding, through color with satin finish.
9. Cornerguards: Where indicated, self-adhering over plastic laminate. Extend to underside of countertop or 4'-0" above finished floor at continuous casework.
  - a. Size: 1-1/8" x 1-1/8"
  - b. Material: Stainless Steel
  - c. Basis of Design: Provide the following or approved equal:
    - 1) DiamondLife Corner Protector

### B. Exposed Cabinet Materials:

1. Plastic Laminate: Type VGS.
  - a. Unless otherwise indicated, provide plastic laminate for exposed surfaces.
  - b. Provide plastic laminate for doors and drawer fronts and where indicated.

### C. Semiexposed Cabinet Materials:

1. Plastic Laminate: Type VGS.
  - a. Provide plastic laminate for semiexposed surfaces, unless otherwise indicated,.

### D. Backer Sheet:

1. Plastic Laminate: Type BKL.

## 2.3 DESIGN, COLOR, AND FINISH

### A. Design: Provide institutional casework of the following design:

1. Flush overlay with wire pulls.

### B. Plastic-Laminate Colors, Patterns, and Finishes: As selected by Architect from manufacturer's full range.

## 2.4 CABINET FABRICATION

### A. Grade: Custom

### B. Plastic-Laminate-Faced Cabinet Construction:

1. Bottoms and Ends of Cabinets, Shelves, and Tops of Wall Cabinets and Tall Cabinets: 3/4-inch particleboard, plastic-laminate faced on exposed surfaces, melamine faced on all semiexposed surfaces.
2. Backs of Cabinets: 1/2-inch particleboard, plastic-laminate faced on exposed surfaces, melamine faced on all semiexposed surfaces.
3. Drawer Fronts: 3/4-inch particleboard, plastic-laminate faced on both sides.

## SECTION 123550 - INSTITUTIONAL CASEWORK

4. Drawer Sides and Backs: 1/2-inch solid wood or plywood, with glued dovetail or multiple-dowel joints, melamine faced on all surfaces.
  5. Drawer Bottoms: 3/8-inch plywood glued and dadoed into front, back, and sides of drawers, melamine faced on all surfaces. Use 1/2-inch material for drawers more than 24 inches wide.
  6. Doors: 3/4-inch particleboard or medium-density fiberboard, plastic-laminate faced on both sides.
- C. Filler Strips: Provide as needed to close spaces between cabinets and walls, ceilings, and indicated equipment. Fabricate from same material and with same finish as cabinets.

### 2.5 CASEWORK HARDWARE

- A. Hardware, General: Provide manufacturer's standard satin-finish, commercial-quality, heavy-duty hardware complying with requirements indicated.
1. Use threaded metal or plastic inserts with machine screws for fastening to particleboard except where hardware is through-bolted from back side.
- B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 135 degrees of opening.
1. MFR: Blum
- C. Pulls: Hafele catalog number 116.39.455 or approved 96 mm nickel plated brass.
- D. Drawer Slides: Full extension zinc-plated, metal-channel, self-closing drawer slides, designed to prevent rebound when drawers are closed, with nylon-tired, ball-bearing rollers, and complying with BHMA A156.9, Type B05091, and rated for the following loads:
1. Box Drawer Slides: 150 lbf.
  2. File Drawer Slides: 200 lbf.
  3. Pencil Drawer Slides: 100 lbf.
  4. MFR: Accuride
- E. Drawer and Cupboard Locks: Cylindrical (cam) type, 5-pin tumbler, brass with chrome-plated finish, complying with BHMA A156.11, Grade 1.
1. Provide a minimum of two keys per lock and six master keys.
  2. Provide locks on all doors and drawers.
- F. Adjustable Shelf Supports: Mortise-type, zinc-plated steel standards and shelf rests complying with BHMA A156.9, Types B04071 and B04091.
- G. Magnetic Pressure Catches: Hafele 245.61.730 or approved equal.

### 2.6 COUNTERTOPS

## **SECTION 123550 - INSTITUTIONAL CASEWORK**

- A. Countertops, General: Provide smooth, clean exposed tops and edges in uniform plane free of defects. Provide front and end overhang of 1 inch over base cabinets, with 6" high backsplash or as indicated on drawings.
  - 1. Fabricate tops with loose backsplashes for field application.
- B. Drill holes in countertops for plumbing fittings and soap dispensers in shop.
- C. Solid-Surfacing-Material Tops: Made from homogeneous solid sheets of filled plastic resin complying with material and performance requirements in ANSI Z124.3, for Type 5 or Type 6, without a precoated finish.

### **2.7 WALL SHELVING**

- A. Plastic-Laminate Shelving: Plastic-laminate sheet, Type HGL or HGP, shop bonded with waterproof glue to both sides of 3/4-inch particleboard or plywood. Sand surfaces to which plastic laminate is to be bonded.
  - 1. Shelf Thickness: 3/4 inch or as indicated.
  - 2. Edge Treatment: Finish both edges with rigid PVC T-molding, through color with satin finish.
- B. Adjustable Shelf Supports: Zinc-plated steel standards and shelf brackets, complying with BHMA A156.9, Types B04102 and B04112.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances, location of reinforcements, and other conditions affecting performance of institutional casework.
  - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 CASEWORK INSTALLATION**

- A. Install plumb, level, and true; shim as required, using concealed shims. Where institutional casework abuts other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical.
- B. Install cabinets using toggle bolts in accordance with requirements specified in AWI Section 1700 for custom grade casework. Provide 6" high, 16 gauge sheet metal backing centered behind each attachment strip:
  - 1. 6" above the bottom of base cabinets
  - 2. 3" below the top of base cabinets
  - 3. 3" above bottom of upper cabinets



## **SECTION 123550 - INSTITUTIONAL CASEWORK**

4. 3" below top of upper cabinets

- C. Base Cabinets: Set cabinets straight, level, and plumb. Adjust subtops within 1/16 inch of a single plane. Fasten cabinets to partition framing, wood blocking, or reinforcements in partitions with fasteners spaced 24 inches o.c. Bolt adjacent cabinets together with joints flush, tight, and uniform. Align similar adjoining doors and drawers to a tolerance of 1/16 inch.
- D. Wall Cabinets: Hang cabinets straight, level, and plumb. Adjust fronts and bottoms within 1/16 inch of a single plane. Fasten to hanging strips, masonry, partition framing, blocking, or reinforcements in partitions. Align similar adjoining doors to a tolerance of 1/16 inch.
- E. Install hardware uniformly and precisely. Set hinges snug and flat in mortises, unless otherwise indicated. Adjust and align hardware so moving parts operate freely and contact points meet accurately. Allow for final adjustment after installation.
- F. Adjust casework and hardware so doors and drawers operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.

### **3.3 INSTALLATION OF TOPS**

- A. Field Jointing: Where possible make in the same manner as shop jointing, using dowels, splines, adhesives, and fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required. Locate field joints where shown on Shop Drawings.
- B. Abut top and edge surfaces in one true plane, with internal supports placed to prevent deflection.
- C. Secure backsplashes to tops with concealed metal brackets at 16 inches o.c. and walls with adhesive.
- D. Seal junctures of top, splash, and walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

### **3.4 INSTALLATION OF SHELVING**

- A. Securely fasten adjustable shelving supports to partition framing, wood blocking, or reinforcements in partitions.
- B. Install shelf standards plumb and at heights to align shelf brackets for level shelves. Install shelving level and straight, closely fitted to other WORK where indicated.

### **3.5 CLEANING AND PROTECTING**

- A. Repair or remove and replace defective WORK as directed on completion of installation.
- B. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

## **SECTION 123550 - INSTITUTIONAL CASEWORK**

- C. Clean, lubricate, and adjust hardware.
- D. Protection: Provide 6-mil plastic or other suitable water-resistant covering over countertop surfaces. Tape to underside of countertop at a minimum of 48 inches o.c. Remove protection at Substantial Completion.

**END OF SECTION 123550**

## **SECTION 210500 - COMMON WORK RESULTS FOR FIRE SUPPRESSION**

### **PART 1 - GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Pipe, fittings, valves, and connections for sprinkler systems.

#### **1.2 RELATED REQUIREMENTS**

- A. Section 099123 – Interior Painting: Preparation and painting of fire protection piping systems.
- B. Section 210553 - Identification for Fire Suppression Piping and Equipment: Piping identification.
- C. Section 220553 - Identification for Plumbing Piping and Equipment: Piping identification.
- D. Section 211300 - Fire-Suppression Sprinkler Systems: Sprinkler systems design.

#### **1.3 REFERENCE STANDARDS**

- A. ASME (BPV IX) - Boiler and Pressure Vessel Code, Section IX - Welding and Brazing Qualifications; The American Society of Mechanical Engineers; 2007.
- B. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; The American Society of Mechanical Engineers; 2005.
- C. ASME B16.3 - Malleable Iron Threaded Fittings; The American Society of Mechanical Engineers; 1998 (R2006).
- D. ASME B16.4 - Gray Iron Threaded Fittings; The American Society of Mechanical Engineers; 1998 (R2006).
- E. ASME B16.5 - Pipe Flanges and Flanged Fittings; The American Society of Mechanical Engineers; 2003 (ANSI/ASME B16.5).
- F. ASME B16.9 - Factory-made Wrought Steel Buttwelding Fittings; The American Society of Mechanical Engineers; 2007.
- G. ASME B16.11 - Forged Steel Fittings, Socket-welding and Threaded; The American Society of Mechanical Engineers; 2005.
- H. ASTM A 47/A 47M - Standard Specification for Ferritic Malleable Iron Castings; 1999 (Reapproved 2009).
- I. ASTM A 53/A 53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2007.

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- J. ASTM A 135/A 135M - Standard Specification for Electric-Resistance Welded Steel Pipe; 2006.
- K. ASTM A 795/A 795M - Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use; 2008.
- L. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2008.
- M. AWWA C110/A21.10 - American National Standard for Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. (75 mm Through 1200 mm), for Water and Other Liquids; American Water Works Association; 2008.
- N. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; American Water Works Association; 2007 (ANSI/AWWA C111/A21.11).
- O. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast, for Water; American Water Works Association; 2009 (ANSI/AWWA C151/A21.51).
- P. NFPA 13 - Standard for the Installation of Sprinkler Systems; National Fire Protection Association; 2007.
- Q. UL 262 - Gate Valves for Fire-Protection Service; Underwriters Laboratories Inc.; 2004.
- R. UL 312 - Check Valves for Fire-Protection Service; Underwriters Laboratories Inc.; 2004.

### **1.4 SUBMITTALS**

- A. General: Provide submittals according to Conditions of Contract, Division 1 Specifications Sections, and as required hereunder. Drawings and general provisions of the contract including General, Supplementary Conditions, and all Division 1 Specification Sections, apply to this Section. Approval of the data shall not eliminate responsibility for compliance with the Drawings or Specifications unless specific attention has been called in writing to proposed deviations at the time of transmittal of the data and such deviations have been approved, not shall it eliminate the responsibility for freedom of errors of any sort in the data. All Mechanical submittal data for Project construction is to be turned in for approval at the same time in order for an efficient review process. Partial submittals may be rejected until the full submittal is received.
- B. See Section 013300 - Administrative Requirements, for submittal procedures.
- C. Specific Products: Trade names and catalog numbers of manufactured products included herein are intended to indicate the type, size and grade of quality of equipment and materials required and such equipment and materials are approved for installation, subject to full compliance with the Specifications. Except where single manufacture is specified for standardization, requires for approval of other manufacturers than those specified must be accompanied by complete descriptions including overall dimensions, performance data, and, if catalog material, identification of specific products or items proposed.

## **SECTION 210500 - COMMON WORK RESULTS FOR FIRE SUPPRESSION**

### **D. Shop Drawings:**

1. Submit preliminary layout of finished ceiling areas indicating only sprinkler locations coordinated with ceiling installation.
2. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, sprinklers, components and accessories. Indicate system controls.
3. Submit shop drawings to authority having jurisdiction for approval. Provide shop drawings of entire project area including all existing features, piping, bracing, and systems connections. Submit proof of approval to ARCHITECT.

### **E. Submittal Format:** All data shall be submitted at one time in neatly bound loose-leaf three ring binders with pockets and tabulated in order of Specification Division 21 0010. All data shall be typed, minimum 10 point font, not exceptions. Data submitted that is not conforming to these specification requirements will be returned without reviewing and will need to be resubmitted at Contractors sole complete cost.

1. Each binder shall have a set of separators with index tabs A to Z. Tabs are to be printed type. Slip in tabs not acceptable.
2. The first page shall be a cover sheet with project name, address, data, submittal product name, all applicable contractors and contact information, and all applicable consultants and contact information.
3. Second page shall be a submittal manual index of all project Specification sections with respective tab numbers, and respective book number, if applicable.
4. The first page of each manuals section shall be an index of the respective project Specification section and number with each product name, manufacturer name and model number.
5. Each manuals section shall be labeled and certified by mechanical Subcontractor that the data presented its in accordance with project Specifications. Index sheet in front of completed document listing each piece of equipment or material submitted.
6. Product Data to be utilized shall be flagged and noted and all other data shall be crossed out or otherwise flagged that it is not in the project.
7. Data shall be inserted in binders in order of Specification number. specification number shall be clearly labeled on the each submittal page.

### **F. As-Built Drawings:** As-Built drawings shall be required at a minimum to two times during the project and at final submittal. Interim as-builts are to provide building maintenance staff updated information as to the systems. As-builts shall accurately show all changes for Contract Document for piping, ductwork, and equipment. As-Built drawings shall be updated daily and available for inspection on-site by the ARCHITECT.

### **G. Operation and Maintenance Data:** See Division 1 for the number of sets of data to be provided for submittal and additional requirements. Separate and complete manuals are required for the two volumes of mechanical work. Provide a minimum of four (4) copies. The following data shall be provided to the ARCHITECT for approval 30 days prior to the request for Substantial completion inspection. Except for the valve directory and nameplate directory, the data shall be provided complete at one time. Partial or separate data will be returned for completion. the valve directory and nameplate directory may be provided for approval previous to the other data. the first section of the O&M Manual shall be as listed in the following subparagraphs in order presented hereunder. All of the following subparagraphs sections shall be furnished with permanent plastic see through covers. See requirements under 1.04 E for additional submittal

## **SECTION 210500 - COMMON WORK RESULTS FOR FIRE SUPPRESSION**

and formatting requirements.

1. Cover and Index sheets as in 1.04 E above.
  2. Description of systems and operating instructions: The Contractor shall prepare a brief written description of all new and modified systems, explaining how the systems operate and indicating the proper settings of controls and switches. The instructions are to include all information required for the proper operation of the systems. Technical knowledge on controls or adjustments requiring specialized technicians should not be included in the instructions.
  3. Manufacturers' literature: Manufacturers' instructions for operation and maintenance of all mechanical equipment and specialties, including replacement parts lists, capacity curves or charts, equipment data sheets, manufacturers' literature on the equipment, and as-built wiring diagrams and control drawings, all suitable for side binding to 8-1/2 x 11 inch size. All data not applicable to the job is to be crossed out or deleted. Manuals turned in for review with non-applicable data not crossed out shall be returned to the Contractor.
  4. Maintenance instructions: Typewritten instructions for the maintenance of the systems, listing each service required on all of the mechanical equipment, including inspections, lubrication, cleaning, checking, and all other operations required. The list is to include all types of bearings installed on the equipment and the type of lubricant required.
  5. Maintenance schedule: List of each item of mechanical equipment requiring inspection, lubrication, cleaning, or service including the type of bearings and type of lubricating means for each piece of equipment. Each item of equipment is to be listed separately with the service required. List to include the times during the year when such inspection and maintenance shall be performed. The specific maintenance required shall be referenced back to the maintenance instructions.
  6. Valve directory: Indicating valve number, size, location, function, and normal position for each numbered valve. The directory shall be provided and approved before installation of the valve tags. A sample arrangement will be furnished upon request. Two copies required for the preliminary list. See Section 15075 - Mechanical Identification.
  7. Guide Documents: Sample operating and maintenance instructions and maintenance schedule may be obtained from the ARCHITECT upon request, to assist in properly setting up the data.
  8. Instructions To Personnel: The mechanical Subcontractor shall instruct operating personnel in the operation and maintenance of the systems before accepting the responsibility of operation and maintenance of the systems.
  9. Qualification Data: For sprinkler pipe fitters.
- H. Shop Drawings: Verify on-site as-built conditions during demolition of construction if required where system is concealed. Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections. Shop drawings shall be coordinated and corrected with all other disciplines for interference and location of existing and new conditions prior to submittal to ARCHITECT.
- I. Submit prior to Substantial Completion Inspection and Final Inspection a detailed list of equipment and systems that will NOT be completed for the completion date. Include status and information of deficiencies from all previous inspection reports.
- J. Submit prior to Re-inspections of Substantial Completion Inspections, if applicable, and the Final Inspection a marked copy of the previous Engineers Inspection Reports detailing all items that have been completed and all items that have not been completed with reasons thereof. Re-

## **SECTION 210500 - COMMON WORK RESULTS FOR FIRE SUPPRESSION**

inspection or Final Inspection will not occur until receipt of this list.

### **1.5 COOPERATIVE WORK**

- A. The Work hereunder shall be coordinated between various mechanical sections including Division 21, 22, 23 and with the Work specified under other divisions or contracts toward rapid completion of the entire project. If any cooperative Work must be altered due to lack of proper supervision hereunder, or failure to make proper provisions in time, then the Work hereunder shall include all expense of such changes as are necessary to be made in the Work under other divisions and contracts, and such changes shall be directly supervised by the ARCHITECT and shall be made to the satisfaction of the ARCHITECT.
- B. In general pitched piping and ductwork shall take preference in location within the project area. Coordination of all drain valves, duct access doors, and other equipment requiring access and maintenance procedures is required with all building components during construction for maximum accessibility and proper location as intended.

### **1.6 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section documented experience. approved by manufacturer.
- C. Conform to UL and FM requirements.
- D. Products Requiring Electrical Connection: Listed and classified as suitable for the purpose specified and indicated.

### **1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver and store valves in shipping containers, with labeling in place.
- B. Provide temporary protective coating on cast iron and steel valves.
- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

### **1.8 EXTRA MATERIALS**

- A. See Section 016000 - Product Requirements, for additional provisions.

## **SECTION 210500 - COMMON WORK RESULTS FOR FIRE SUPPRESSION**

### **PART 2 - PRODUCTS**

#### **2.1 FIRE PROTECTION SYSTEMS**

- A. Sprinkler Systems: Conform work to NFPA 13.
- B. Welding Materials and Procedures: Conform to ASME Code.

#### **2.2 ABOVE GROUND PIPING**

- A. Steel Pipe: ASTM A 795 Schedule 10 or ASTM A 53 Schedule 40, black.
  - 1. Steel Fittings: ASME B16.9, wrought steel, butt welded.
  - 2. Cast Iron Fittings: ASME B16.1, flanges and flanged fittings and ASME B16.4, threaded fittings.
  - 3. Malleable Iron Fittings: ASME B16.3, threaded fittings.
  - 4. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.

#### **2.3 PIPE HANGERS AND SUPPORTS**

- A. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.
- B. Hangers for Pipe Sizes 2 inches and Over: Carbon steel, adjustable, clevis.
- C. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
- D. Vertical Support: Steel riser clamp.
- E. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

#### **2.4 DRAIN VALVES**

- A. Ball Valve:
  - 1. Compression stop. Bronze with hose thread nipple and cap.
  - 2. Brass with cap and chain, 3/4 inch hose thread.

### **PART 3 - EXECUTION**

#### **3.1 PREPARATION**



## **SECTION 210500 - COMMON WORK RESULTS FOR FIRE SUPPRESSION**

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and foreign material, from inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

### **3.2 INSTALLATION**

- A. Install sprinkler system and service main piping, hangers, and supports in accordance with NFPA 13.
- B. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.
- C. Install piping to conserve building space, to not interfere with use of space and other work.
- D. Group piping whenever practical at common elevations.
- E. Sleeve pipes passing through partitions, walls, and floors.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- G. Inserts:
  - 1. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.
- H. Pipe Hangers and Supports:
  - 1. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
  - 2. Place hangers within 12 inches of each horizontal elbow.
  - 3. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
  - 4. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
  - 5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
- I. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.
- J. Prepare pipe, fittings, supports, and accessories for finish painting. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding. Refer to Section 099123.
- K. Do not penetrate building structural members unless indicated.
- L. Provide sleeves when penetrating footings, floors, and walls. Seal pipe and sleeve penetrations

## **SECTION 210500 - COMMON WORK RESULTS FOR FIRE SUPPRESSION**

to achieve fire resistance equivalent to fire separation required.

- M. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing is consistently provided.
- N. Die cut threaded joints with full cut standard taper pipe threads with red lead and linseed oil or other non-toxic joint compound applied to male threads only.
- O. Install valves with stems upright or horizontal, not inverted. Remove protective coatings prior to installation.
- P. Provide drain valves at main shut-off valves, low points of piping and apparatus.

**END OF SECTION 210500**

## **SECTION 210553 - IDENTIFICATION FOR FIRE SUPPRESSION PIPING AND EQUIPMENT**

### **PART 1 - GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Nameplates.
- B. Tags.
- C. Pipe Markers.

#### **1.2 RELATED REQUIREMENTS**

- A. Section 099123 - Painting and Coating: Identification painting.

#### **1.3 REFERENCE STANDARDS**

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; The American Society of Mechanical Engineers; 2007.
- B. ASTM D 709 - Standard Specification for Laminated Thermosetting Materials; 2001 (Reapproved 2007).

#### **1.4 SUBMITTALS**

- A. See Section 013300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturers catalog literature for each product required.
- C. Manufacturer's Installation Instructions: Indicate special procedures, and installation.
- D. Project Record Documents: Record actual locations of tagged valves.

### **PART 2 - PRODUCTS**

#### **2.1 IDENTIFICATION APPLICATIONS**

- A. Control Panels: Nameplates.
- B. Pumps: Nameplates.
- C. Small-sized Equipment: Tags.

## **SECTION 210553 - IDENTIFICATION FOR FIRE SUPPRESSION PIPING AND EQUIPMENT**

- D. Valves: Nameplates and ceiling tacks where above lay-in ceilings.

### **2.2 NAMEPLATES**

#### **A. Manufacturers:**

1. Kolbi Pipe Marker Co.: [www.kolbipipemarkers.com](http://www.kolbipipemarkers.com).
2. Seton Identification Products: [www.seton.com](http://www.seton.com).
3. Substitutions: See Section 016000 - Product Requirements.

#### **B. Description: Laminated three-layer plastic with engraved letters.**

1. Letter Color: White.
2. Letter Height: 1/4 inch.
3. Background Color: Black.
4. Thickness: 1/8 inch.

### **2.3 TAGS**

#### **A. Manufacturers:**

1. Advanced Graphic Engraving: [www.advancedgraphicengraving.com](http://www.advancedgraphicengraving.com).
2. Brady Corporation: [www.bradycorp.com](http://www.bradycorp.com).
3. Kolbi Pipe Marker Co.: [www.kolbipipemarkers.com](http://www.kolbipipemarkers.com).
4. Seton Identification Products: [www.seton.com](http://www.seton.com).
5. Substitutions: See Section 016000 - Product Requirements.

#### **B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.**

#### **C. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.**

### **2.4 PIPE MARKERS**

#### **A. Manufacturers:**

1. Brady Corporation: [www.bradycorp.com](http://www.bradycorp.com).
2. Kolbi Pipe Marker Co.: [www.kolbipipemarkers.com](http://www.kolbipipemarkers.com).
3. MIFAB, Inc.: [www.mifab.com](http://www.mifab.com).
4. Substitutions: See Section 016000 - Product Requirements.

#### **B. Color: Conform to ASME A13.1.**

#### **C. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.**

## **SECTION 210553 - IDENTIFICATION FOR FIRE SUPPRESSION PIPING AND EQUIPMENT**

- D. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

### **2.5 CEILING TACKS**

- A. Description: Steel with 3/4 inch diameter color coded head.

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

- A. Degrease and clean surfaces to receive adhesive for identification materials.
- B. Prepare surfaces in accordance with Section 099123 for stencil painting.

### **3.2 INSTALLATION**

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

**END OF SECTION 210553**

## **SECTION 211300 - FIRE-SUPPRESSION SPRINKLER SYSTEMS**

### **PART 1 - GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Wet-pipe sprinkler system.
- B. System design, installation, and certification.

#### **1.2 RELATED REQUIREMENTS**

- A. The sprinkler mechanical work is governed by the entirety of the Specification Divisions not only Division 21, 22 and 23. The entire specification must be examined for requirements related to the Work hereunder. The Work covered by this and all other Mechanical Subsections consists of furnishing labor, equipment, and materials in accordance with the specifications and drawings, together with any incidental items not shown or specified which can be reasonably inferred or taken as belonging to the Work and necessary in good practice to provide a complete and operating system described or shown as intended.
- B. Drawings and General provisions of the Contract, including General, Supplementary Conditions, and all Division Specifications Section, apply to this section.
- C. Section 283111 - Fire Detection and Alarm.
- D. Section 210500 - Common Work Results for Fire Suppression: Pipe, fittings, and valves.
- E. Section 210553 - Identification for Fire Suppression Piping and Equipment.
- F. Section 262726 – Wiring Devices: Electrical characteristics and wiring connections.

#### **1.3 REFERENCE STANDARDS**

- A. FM P7825 - Approval Guide; Factory Mutual Research Corporation; current edition.
- B. ITS (DIR) - Directory of Listed Products; Intertek Testing Services NA, Inc.; current edition.
- C. NFPA 13 - Standard for the Installation of Sprinkler Systems; National Fire Protection Association; 2007.
- D. UL (FPED) - Fire Protection Equipment Directory; Underwriters Laboratories Inc.; current edition.

#### **1.4 SUBMITTALS**

- A. See Section 013300 - Administrative Requirements, for submittal procedures.

## **SECTION 211300 - FIRE-SUPPRESSION SPRINKLER SYSTEMS**

- B. Product Data: Provide data on sprinklers, valves, and specialties, including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.
- C. Shop Drawings:
  - 1. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, sprinklers, components and accessories. Indicate system controls.
  - 2. Submit shop drawings to authority having jurisdiction for approval. Submit proof of approval to ARCHITECT.
- D. Project Record Documents: Record actual locations of sprinklers and deviations of piping from drawings. Indicate drain and test locations.
- E. Operation and Maintenance Data: Include components of system, servicing requirements, record drawings, inspection data, replacement part numbers and availability, and location and numbers of service depot.
- F. Maintenance Materials: Furnish the following for City and Borough of Juneau's use in maintenance of project.
  - 1. See Section 016000 - Product Requirements, for additional provisions.
  - 2. Extra Sprinklers: Type and size matching those installed, in quantity required by referenced NFPA design and installation standard.
  - 3. Sprinkler Wrenches: For each sprinkler type.

### **1.5 QUALITY ASSURANCE**

- A. Maintain one copy of referenced design and installation standard on site.
- B. Conform to UL requirements.
- C. Designer Qualifications: Design system under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in Alaska.
- D. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

### **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Store products in shipping containers and maintain in place until installation. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

## **PART 2 - PRODUCTS**

## **SECTION 211300 - FIRE-SUPPRESSION SPRINKLER SYSTEMS**

### **2.1 SPRINKLER SYSTEM**

- A. Sprinkler System: Provide coverage for entire building:
- B. Occupancy: Light hazard; comply with NFPA 13.
- C. Water Supply: Determine volume and pressure from water flow test data.
- D. Interface system with building control system.
- E. Provide fire department connections where indicated.
- F. Storage Cabinet for Spare Sprinklers and Tools: Steel, located adjacent to alarm valve.
  - 1. Tyco Fire Suppression & Building Products: [www.tyco-fire.com](http://www.tyco-fire.com).

### **2.2 SPRINKLERS**

- A. Manufacturers:
  - 1. TYCO.
  - 2. Central Systems
  - 3. Grinnel Corp.
  - 4. Reliable Sprinkler Corp.
  - 5. Star Sprinkler Corp.
- B. Suspended Ceiling Type: Standard pendant type with matching push on escutcheon plate.
  - 1. Finish: Brass.
  - 2. Escutcheon Plate Finish: Brass.
  - 3. Fusible Link: Bulb type link temperature rated for specific area hazard.
- C. Exposed Area Type: Standard upright type with guard.
  - 1. Finish: Brass.
  - 2. Fusible Link: Bulb type link temperature rated for specific area hazard.
- D. Sidewall Type: Standard horizontal sidewall type with matching push on escutcheon plate and guard.
  - 1. Finish: Brass.
  - 2. Escutcheon Plate Finish: Brass.
  - 3. Fusible Link: Bulb type link temperature rated for specific area hazard.
- E. Guards: Finish to match sprinkler finish.
- F. Spray Nozzles: Brass with solid cone discharge, 30 degrees of arc with blow-off dust cap.

## **PART 3 - EXECUTION**

**BRH MEDICAL SURGICAL EAST WING RENOVATION  
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**FIRE-SUPPRESSION  
SPRINKLER SYSTEMS  
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## **SECTION 211300 - FIRE-SUPPRESSION SPRINKLER SYSTEMS**

### **3.1 INSTALLATION**

- A. Install in accordance with referenced NFPA design and installation standard.
- B. Install equipment in accordance with manufacturer's instructions.
- C. Place pipe runs to minimize obstruction to other work.
- D. Place piping in concealed spaces above finished ceilings.
- E. Center sprinklers in one direction only in ceiling tile with location in other direction variable, dependent upon spacing and coordination with ceiling elements.
- F. Apply masking tape or paper cover to ensure concealed sprinklers, cover plates, and sprinkler escutcheons do not receive field paint finish. Remove after painting. Replace painted sprinklers.
- H. Flush entire piping system in project area of foreign matter.
- J. Install guards on sprinklers where indicated.
- K. Hydrostatically test entire system in project area.
- L. Require test be witnessed by Fire Marshal.

**END OF SECTION 211300**

## **SECTION 220510 - GENERAL MECHANICAL PLUMBING**

### **PART 1 - GENERAL**

#### **1.1 WORK INCLUDED**

- A. The mechanical Work is governed by the entire specification and not just Division 21, 22, 23. The entire specification must be examined for requirements relating to the Work hereunder. The Work covered by this and all other Mechanical subsections consists of furnishing labor, equipment, and materials in accordance with the specifications or drawings, or both, together with any incidental items not shown or specified which can be reasonably inferred or taken as belonging to the Work and necessary in good practice to provide a complete system described or shown as intended.
- B. Project is a renovation that requires specific demolition and installation for phased project areas with the rest of the mechanical systems remaining active serving an occupied building.
  - 1. Shut downs of mechanical systems will generally occur in off hours and during light occupancy times. Coordinate shut down times to be a minimum time required.
  - 2. The work will require phasing particularly for the second floor areas. The extent of phasing is to be coordinated with other contractors and Owner. However, there may be equipment, piping, ductwork, sprinkler, and controls systems that will need to be removed and/or installed outside the phasing areas including shut downs and reactivation of main mechanical systems. Work required out of the phasing project areas will generally occur during unoccupied times. Coordinate with Project Architect and owner for access to these occupied and possibly secure areas.
  - 3. Construction documents for the renovation project do not show all required piping and ductwork offsets for a complete and operating systems. Existing systems may require new systems to be modified for installation. Construction documents show reported as-built piping and ductwork systems. Verify on site all existing conditions.
  - 4. Demolition of and Connection to Existing Material, Equipment, and Systems:
    - a. Mechanical drawings show reported as-built and contract document locations of underground piping taken from past project drawings. Contractor to determine actual existing locations of underground piping as needed without additional cost to the Owner. Contractor to utilize pipe location devices as needed. Contact ARCHITECT if actual piping locations are different than shown. Excavation shall be required to locate piping, remove piping, install piping, and connect to existing piping.
      - 1) Where select piping systems are shown to be partially removed for connection, prepare and protect the connection points appropriately to ensure later continuity of Work. CONTRACTOR shall provide all temporary supports as required and completely replace material and equipment that are not suitably protected during construction and becomes damaged.
      - 2) CONTRACTOR shall provide all temporary caps for ductwork, piping, pneumatic controls, as required. CONTRACTOR shall provide all temporary partitions such as air-tight air plenum separations as required to maintain continuity of systems and to not contaminate existing systems or finishes.

## **SECTION 220510 - GENERAL MECHANICAL PLUMBING**

CONTRACTOR shall remove all temporary provisions when the phase of Work is completed or earlier if required.

- 3) Where items are shown to be removed such as piping or ductwork it is to be assumed that this includes the removal of the respective system including but not limited to pipe and duct hangers, supports, conduit, wiring, valves, and other related trim and appurtenances. Piping to be removed through a floor assumes that the piping is to be capped below floor and the floor finished smooth.
- 4) Mechanical Contractor shall be available during Demolition Work for coordination and assistance for related Work. Mechanical Contractor shall locate, isolate, and drain piping systems to be removed.
- 5) Concrete wall and floor penetrations required. Saw cut or core drill as required. Sleeve penetrations as specified. Coordinate with Architect for structural beam penetration approvals.
- 6) Demolition drawings do not show all work involved but rather a representation of the work expected. Demolition drawings are to be coordinated with the phase drawings for more information as to when work may be required.

### **C. WORDING OF THE SPECIFICATIONS**

1. These specifications are of the abbreviated or streamlined type and frequently include incomplete sentences. However, periods are used for clarity. Words such as "shall", "shall be", "the Contractor shall", and similar mandatory phrases shall be supplied by inference in the same manner as they are required for the notes on the drawings.

### **D. CODES AND REGULATIONS**

1. All Work hereunder shall be strictly in conformance with applicable codes and regulations. All plumbing Work shall be in accordance with the Codes listed below and City and Borough of Juneau modifications insofar as minimum requirements are concerned, but the drawings and specifications shall govern in case the minimum requirements are exceeded. All electrical equipment shall bear the UL label.
  - a. Title 19: City and Borough of Juneau, Building Regulation
  - b. International Building Code and Mechanical Code-2006 edition
  - c. Uniform Plumbing Code-2006 edition
  - d. International Fire Code-2006 edition
  - e. Uniform Fire Code (UFC)
  - f. Local Sewer and Water District Requirements
  - g. City and Borough of Juneau Department of Health
  - h. State Department of Health
  - i. Local Fire Marshall
  - j. Local Air Pollution Control Agency
  - k. State of Alaska Boiler and Unfired Pressure Vessel Inspection Law
  - l. Occupational Safety and Health Administration (OSHA)
  - m. National Fire Protection Association (NFPA)
  - n. National Electric Code (NEC)
  - o. Alaska State Fire Laws
  - p. Environmental Protection Agency (EPA)
  - q. Sheet Metal and Air Conditioning Contractors Association (SMACNA)

## **SECTION 220510 - GENERAL MECHANICAL PLUMBING**

- p. Pressure Vessels: ASME code stamp required on all pressure vessels and relief valves.

### **1.2 SUBMITTALS**

- A. General: Provide submittals according to Conditions of Contract, Division 1 Specifications Sections, and as required hereunder. Drawings and general provisions of the Contract, including General, Supplementary Conditions, and all Division 1 Specification Sections, apply to this Section. Approval of the data shall not eliminate responsibility for compliance with the Drawings or Specifications unless specific attention has been called in writing to proposed deviations at the time of transmittal of the data and such deviations have been approved, nor shall it eliminate the responsibility for freedom of errors of any sort in the data. All Mechanical submittal data for Project construction is to be turned in for approval at the same time in order for an efficient review process. Partial submittals may be rejected until the full submittal is received.
- B. Specified Products: Trade names and catalog numbers of manufactured products included herein are intended to indicate the type, size, and grade of quality of equipment and materials required and such equipment and materials are approved for installation, subject to full compliance with the Specifications. Except where single manufacture is specified for standardization, requests for approval of other manufacturers than those specified must be accompanied by complete descriptions including overall dimensions, performance data, and, if catalog material, identification of specific products or items proposed.
- C. Submittal Format: All data shall be submitted at one time in neatly bound loose-leaf three ring binders with pockets and tabulated in order of Specification Division 15000 section. All data shall be typed, minimum 10 point font, no exceptions. Data submitted that is not conforming to these specification requirements will be returned without reviewing and will need to be resubmitted at Contractors sole complete cost.
  - 1. Each binder shall have a set of separators with index tabs A to Z. Tabs are to be printed type. Slip-in tabs not acceptable.
  - 2. The first page shall be a cover sheet with project name, address, date, submittal product name, all applicable contractors and contact information, and all applicable consultants and contact information.
  - 3. Second page shall be a submittal manual index of all project Specification sections with respective tab numbers, and respective book number, if applicable.
  - 4. The first page of each manuals section shall be an index of that respective project Specification section and number with each product name, manufacturer name and model number.
  - 5. Each manuals section shall be labeled and certified by mechanical Subcontractor that the data presented is in accordance with project Specifications. Index sheet in front of completed binder listing each piece of equipment or material submitted.
  - 6. Product Data to be utilized shall be flagged and noted and all other data shall be crossed out or otherwise flagged that it is not in the project.
  - 7. Data shall be inserted in binders in order of Specification number. Specification number shall be clearly labeled on each submittal page.
  - 8. As-built Drawings: As-built drawings shall be required from all Mechanical

## SECTION 220510 - GENERAL MECHANICAL PLUMBING

Subcontractors and shall accurately show all changes from Contract Documents for existing and new piping, ductwork, and equipment. As-built drawings shall be updated daily and available for inspection on-site by the ARCHITECT.

9. Operating and Maintenance Data: See Division 1 for the number of sets of data to be provided for submittal and additional requirements. Separate and complete manuals are required for the two volumes of mechanical work. Provide a minimum of four (4) copies. The following data shall be provided to the ARCHITECT for approval 30 days prior to the request for Substantial Completion inspection. Except for the valve directory and nameplate directory, the data shall be provided complete at one time. Partial or separate data will be returned for completion. The valve directory and nameplate directory may be provided for approval previous to the other data. The first section of the O&M manual shall be as listed in the following subparagraphs in order presented hereunder. All of the following subparagraphs sections shall be furnished with permanent plastic see through covers. See requirements under 1.4.C for additional submittal and formatting requirements.
  - a. Cover and Index sheets as in 1.4.C. above.
  - b. Description of systems and operating instructions: The Contractor shall prepare a brief type written description of all new and modified systems, explaining how the systems operate and indicating the proper settings of controls and switches. The instructions are to include all information required for the proper settings of controls and switches. The instructions are to include all information required for the proper operation of the systems. Technical knowledge on controls or adjustments requiring specialized technicians should not be included in the instructions.
  - c. Nameplate directory: List of all new air handlers, fans, water heaters, expansion tanks, thermostatic mixing valves, pumps, terminal heating units, and other equipment nameplates, giving manufacturer's nameplate data, nameplate designation, location of equipment, area served, switch location, and normal position of the switch. Motor data must include the horsepower, voltage, full load amperage, phase, etc. See Section 15075 - Mechanical Identification.
  - d. Manufacturers' literature: Manufacturers' instructions for operation and maintenance of all mechanical equipment and specialties, including replacement parts lists, capacity curves or charts, equipment data sheets, manufacturers' literature on the equipment, and as-built wiring diagrams and control drawings, all suitable for side binding to 8-1/2 x 11 inch size. All data not applicable to the job is to be crossed out or deleted. Manuals turned in for review with non-applicable data not crossed out shall be returned to the Contractor.
  - e. Maintenance instructions: Typewritten instructions for the maintenance of the systems, listing each service required on all of the mechanical equipment, including inspections, lubrication, cleaning, checking, and all other operations required. The list is to include all types of bearings installed on the equipment and the type of lubricant required.
  - f. Maintenance schedule: List of each item of mechanical equipment requiring inspection, lubrication, cleaning, or service including the type of bearings and type of lubricating means for each piece of equipment. Each item of equipment is to be listed separately with the service required. List to include the times during the year when such inspection and maintenance shall be performed. The specific maintenance required shall be referenced back to the maintenance instructions.
  - g. Valve directory: Indicating valve number, size, location, function, and normal

## **SECTION 220510 - GENERAL MECHANICAL PLUMBING**

position for each numbered valve. The directory shall be provided and approved before installation of the valve tags. A sample arrangement will be furnished upon request. Two copies required for the preliminary list. See Section 15075 - Mechanical Identification.

10. Guide Documents: Sample operating and maintenance instructions and maintenance schedule may be obtained from the ARCHITECT upon request, to assist in properly setting up the data.
11. Instructions To Personnel: The mechanical Subcontractor shall instruct operating personnel in the operation and maintenance of the systems before accepting the responsibility of operation and maintenance of the systems.
12. Qualification Data: For sheet metal installers. For pipe fitters.
13. Shop Drawings: Verify on-site as-built conditions during demolition of construction if required where system is concealed. Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections. Shop drawings shall be coordinated and corrected with all other disciplines for interference and location of existing and new conditions prior to submittal to ARCHITECT.
14. Submit prior to Substantial Completion Inspection and Final Inspection a detailed list of equipment and systems that will NOT be completed for the completion date. Include status and information of deficiencies from all previous inspection reports.
15. Submit prior to Re-inspections of Substantial Completion Inspections, if applicable, and the Final Inspection a marked copy of the previous Engineers Inspection Reports detailing all items that have been completed and all items that have not been completed with reasons thereof. Re-inspection or Final Inspection will not occur until receipt of this list.

### **D. COOPERATIVE WORK**

1. The Work hereunder shall be coordinated between various mechanical sections including Division 13 and with the Work specified under other divisions or contracts toward rapid completion of the entire project. If any cooperative Work must be altered due to lack of proper supervision hereunder, or failure to make proper provisions in time, then the Work hereunder shall include all expense of such changes as are necessary to be made in the Work under other divisions and contracts, and such changes shall be directly supervised by the ARCHITECT and shall be made to the satisfaction of the ARCHITECT.
2. In general pitched piping and ductwork shall take preference in location within the project area. Coordination of all drain valves, duct access doors, and other equipment requiring access and maintenance procedures is required with all building components during construction for maximum accessibility and proper location as intended.
3. Existing systems: Where modifications are to be made to existing systems which are required to remain in service for areas of the building not affected by this Project, CONTRACTOR shall coordinate disruption with Using Agency. WORK shall be performed only upon specific Approval, time, and duration as agreed to by the ARCHITECT.

### **E. QUALITY ASSURANCE**

1. Perform Work in conformance with all applicable codes, regulations, local ordinances, contract documents, and generally accepted good practice. If discrepancies exist between

## **SECTION 220510 - GENERAL MECHANICAL PLUMBING**

specifications and contract plans then the solution that provides the Owner with the highest quality of product or installation shall be deemed as intended by the contract documents.

2. All sheet metal workers shall have a minimum documented sheet metal fabrication and installation experience in commercial and industrial facilities of 3 years or be enrolled in an Alaska Department of Labor approved Sheet Metal Apprentice program. The ratio of on-site workers shall not exceed 3 apprentices or sheet metal workers for every one foreman. A foreman is defined as a sheet metal worker with minimum 3 years experience as detailed above or is an approved Journeyman.
3. All Plumbers and Pipe Fitters shall have a minimum documented installation experience in commercial or industrial facilities of 3 years or be enrolled in an Alaska Department of Labor approved Plumbers and Pipe Fitters Apprentice program. The ratio of on-site workers shall not exceed 2 apprentices or pipe fitters for every one Journeyman.

### **F. FIELD MEASUREMENTS**

1. See Division 1 for specific requirements regarding: Field Measurements and Site Conditions.
2. Verifications: All measurements shall be verified at the site and prior to fabrications of equipment and systems. The existing conditions shall be fully observed before beginning the Work hereunder, and the Work hereunder executed in full coordination with the existing conditions observed. All hazardous material including asbestos materials that are discovered during the course of construction shall be immediately brought to the attention of the ARCHITECT for action. All Work performed with hazardous materials not approved by the Owner shall be at the full responsibility of the contractor and not the Owner.
3. Changes: Variations apparently necessary due to existing conditions shall be made only on approval in writing by the ARCHITECT.

### **G. TRANSPORTATION TO SITE AND ON-SITE STORAGE**

1. Protection: Materials and equipment which are intended to be installed and operated inside completed building envelope shall be protected. It is CONTRACTOR'S responsibility to deliver all material and equipment to ARCHITECT at completion of WORK in an "as new condition." "As new condition" shall mean free of corrosion, dirt, rust, stain, or physical damage resulting from or during transportation to site, temporary storage at site, and construction period. CONTRACTOR must address potential damage to material and equipment caused by exposure to elements including wind, rain, and construction process. CONTRACTOR shall take all precautions to protect material and equipment. Precautions shall include, but not be limited to, protection from moisture to ensure materials and equipment remain dry, and equipment is reasonably free of debris. Material and equipment which have been exposed to moisture are subject to timely replacement by CONTRACTOR at no additional cost to OWNER.

### **H. NAMEPLATES:**

1. Information: Provide major components of equipment with Manufacturer's name, address, catalog number, and capacity indicated on a nameplate, securely affixed in a conspicuous place on component.

## **SECTION 220510 - GENERAL MECHANICAL PLUMBING**

### **I. WARRANTY**

1. See Division 1 for specific requirements regarding: Product warranties and product bonds.
2. The contractor shall provide continuous and generally trouble-free operation of the mechanical systems for the time period listed in Division 1 or for one year after final completion of entire project whichever time period is longer. The operation and maintenance of systems other than incidental operations such as room thermostat settings or changing of air filters, shall be the sole responsibility of the contractor and shall be addressed by the contractor immediately if deficiencies are present. Leaking of valves, flanges, or air vents shall be addressed immediately by the contractor during the warranty period. Control settings, noise problems, and other deficiencies resulting in unsatisfactory environmental conditions shall be addressed immediately.

### **PART 2 - PRODUCTS (NOT USED)**

### **PART 3 - EXECUTION (NOT USED)**

**END OF SECTION 220510**



## **SECTION 220519 - METERS AND GAGES FOR PLUMBING PIPING**

### **PART 1 - GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Thermometers and thermometer wells.

#### **1.2 RELATED REQUIREMENTS**

- A. Drawings and General provisions of the Contract, including General, Supplementary Conditions, and all Division Specifications Section, apply to this section.

#### **1.3 REFERENCE STANDARDS**

- A. ASME B40.100 - Pressure Gauges and Gauge Attachments; The American Society of Mechanical Engineers; 2005.
- B. ASTM E 1 - Standard Specification for ASTM Liquid-in-Glass Thermometers; 2007.
- C. ASTM E 77 - Standard Test Method for Inspection and Verification of Thermometers; 2007.

#### **1.4 SUBMITTALS**

- A. See Section 013300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide list that indicates use, operating range, total range and location for manufactured components.
- C. Project Record Documents: Record actual locations of components and instrumentation.
- D. Operation and Maintenance Data:.
- E. Maintenance Materials: Furnish the following for City and Borough of Juneau's use in maintenance of project.
  - 1. See Section 01 6000 - Product Requirements. for additional provisions.
  - 2. Extra Pressure Gages: One of each type and size.

#### **1.5 FIELD CONDITIONS**

- A. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports and test plugs.

### **PART 2 - PRODUCTS**

**BRH MEDICAL SURGICAL EAST WING RENOVATION  
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**METERS AND GAGES FOR  
PLUMBING PIPING  
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## SECTION 220519 - METERS AND GAGES FOR PLUMBING PIPING

### 2.1 STEM TYPE THERMOMETERS

#### A. Manufacturers:

1. Dwyer Instruments, Inc: [www.dwyer-inst.com](http://www.dwyer-inst.com).
2. Omega Engineering, Inc: [www.omega.com](http://www.omega.com).
3. Weksler Glass Thermometer Corp: [www.wekslerglass.com](http://www.wekslerglass.com).

#### B. Thermometers - Fixed Mounting: Red- or blue-appearing non-toxic liquid in glass; ASTM E 1; lens front tube, cast aluminum case with enamel finish.

1. Size: 9 inch scale.
2. Window: Clear Lexan.
3. Accuracy: 2 percent, per ASTM E 77.
4. Calibration: Degrees F.

#### C. Stem type Thermometers - Fixed Mounting: Red- or blue-appearing non-toxic liquid in glass; ASTM E 1; lens front tube, cast aluminum case with enamel finish.

1. Size: 9 inch scale.
2. Window: Clear Lexan.
3. Stem: 3/4 inch brass.
4. Accuracy: 2 percent, per ASTM E 77.
5. Calibration: Degrees F and Degree C.

#### D. Thermometers - Adjustable Angle: digital solar powered thermometer, with positive locking device.

1. Size: NA.
2. Window: LCD display
3. Stem: 3/4 inch NPT, 3-1/2 inch long.
4. Accuracy: 2 percent.
5. Calibration: Degrees F and Degrees C.

### 2.2 THERMOMETER SUPPORTS

#### A. Socket: Brass separable sockets for thermometer stems with or without extensions as required, and with cap and chain.

#### B. Flange: 3 inch outside diameter reversible flange, designed to fasten to sheet metal air ducts, with brass perforated stem.

### 2.3 TEST PLUGS

#### A. Test Plug: 1/4 inch or 1/2 inch brass fitting and cap for receiving 1/8 inch outside diameter pressure or temperature probe with neoprene core for temperatures up to 200 degrees F.

#### B. Test Kit: Carrying case, internally padded and fitted containing one 2-1/2 inch diameter

## **SECTION 220519 - METERS AND GAGES FOR PLUMBING PIPING**

pressure gages, one gage adapters with 1/8 inch probes, two 1 inch dial thermometers.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inch for installation of thermometer sockets. Ensure sockets allow clearance from insulation.
- C. Install thermometer sockets adjacent to controls systems thermostat, transmitter, or sensor sockets.
- D. Provide instruments with scale ranges selected according to service with largest appropriate scale.
- E. Install gages and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.
- F. Adjust gages and thermometers to final angle, clean windows and lenses, and calibrate to zero.
- G. Locate test plugs adjacent thermometers and thermometer sockets.

**END OF SECTION 220519**

## **SECTION 220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT**

### **PART 1 - GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Nameplates.
- B. Tags.
- C. Pipe Markers.

#### **1.2 RELATED REQUIREMENTS**

- A. Section 099123 - Painting and Coating: Identification painting.

#### **1.3 REFERENCE STANDARDS**

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; The American Society of Mechanical Engineers; 2007.
- B. ASTM D 709 - Standard Specification for Laminated Thermosetting Materials; 2001 (Reapproved 2007).

#### **1.4 SUBMITTALS**

- A. See Section 013300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturers catalog literature for each product required.
- C. Manufacturer's Installation Instructions: Indicate special procedures, and installation.
- D. Project Record Documents: Record actual locations of tagged valves.

### **PART 2 - PRODUCTS**

#### **2.1 IDENTIFICATION APPLICATIONS**

- A. Air Handling Units: Nameplates.
- B. Automatic Controls: Tags. Key to control schematic.
- C. Control Panels: Nameplates.
- D. Dampers: Ceiling tacks, where located above lay-in ceiling.

## **SECTION 220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT**

E. Tanks: Nameplates.

F. Valves: Tags and ceiling tacks where located above lay-in ceiling.

### **2.2 NAMEPLATES**

A. Manufacturers:

1. Kolbi Pipe Marker Co.: [www.kolbipipemarkers.com](http://www.kolbipipemarkers.com).
2. Seton Identification Products: [www.seton.com](http://www.seton.com).
3. Substitutions: See Section 016000 - Product Requirements.

B. Description: Laminated three-layer plastic with engraved letters.

1. Letter Color: White.
2. Letter Height: 1/4 inch.
3. Background Color: Black.
4. Plastic: Conform to ASTM D 709.

### **2.3 TAGS**

A. Manufacturers:

1. Advanced Graphic Engraving: [www.advancedgraphicengraving.com](http://www.advancedgraphicengraving.com).
2. Brady Corporation: [www.bradycorp.com](http://www.bradycorp.com).
3. Kolbi Pipe Marker Co.: [www.kolbipipemarkers.com](http://www.kolbipipemarkers.com).
4. Seton Identification Products: [www.seton.com](http://www.seton.com).
5. Substitutions: See Section 016000 - Product Requirements.

B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

### **2.4 PIPE MARKERS**

A. Manufacturers:

1. Brady Corporation: [www.bradycorp.com](http://www.bradycorp.com).
2. Kolbi Pipe Marker Co.: [www.kolbipipemarkers.com](http://www.kolbipipemarkers.com).
3. MIFAB, Inc.: [www.mifab.com](http://www.mifab.com).
4. Seton Identification Products; [www.seton.com](http://www.seton.com).
5. Substitutions: See Section 016000 - Product Requirements.

B. Comply with ASME A13.1.

C. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

## **SECTION 220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT**

- D. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

### **2.5 CEILING TACKS**

- A. Description: Steel with 3/4 inch diameter color coded head.
- B. Color code as follows:
  - 1. HVAC Equipment: Yellow.
  - 2. Plumbing Valves: Green.

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

- A. Degrease and clean surfaces to receive adhesive for identification materials.
- B. Prepare surfaces in accordance with Section 099123 for stencil painting.

### **3.2 INSTALLATION**

- A. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install tags with corrosion resistant chain.
- C. Install plastic pipe markers in accordance with manufacturer's instructions.
- D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.
- E. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

**END OF SECTION 220553**

## SECTION 220719 - PLUMBING PIPING INSULATION

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Piping insulation.
- B. Section includes thermal insulation for piping systems including vapor retarders, jackets, and accessories. All new piping is to be insulated as specified.

#### 1.2 RELATED REQUIREMENTS

- A. Drawings and General provisions of the Contract, including General, Supplementary Conditions, and all Division Specifications Section, apply to this section.
- B. Section 221005 - Plumbing Piping: Placement of hangers and hanger inserts.
- C. Section 232113 - Hydronic Piping: Placement of hangers and hanger inserts.

#### 1.3 REFERENCE STANDARDS

- A. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2007.
- B. ASTM C 177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded Hot Plate Apparatus; 2004.
- C. ASTM C 449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement; 2007.
- D. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2004.
- E. ASTM C 547 - Standard Specification for Mineral Fiber Pipe Insulation; 2007.
- F. ASTM C 585 - Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System); 1990 (Reapproved 2004).
- G. ASTM C 795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008.
- H. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2008.
- I. ASTM E 96/E 96M - Standard Test Methods for Water Vapor Transmission of Materials; 2005.
- J. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials;

## **SECTION 220719 - PLUMBING PIPING INSULATION**

National Fire Protection Association; 2006.

- K. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Underwriters Laboratories Inc.; 2008.

### **1.4 SUBMITTALS**

- A. See Section 013300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.
- C. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

### **1.5 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum 3 years of experience.

### **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

### **1.7 FIELD CONDITIONS**

- A. Maintain ambient conditions required by manufacturers of each product.
- B. Maintain temperature before, during, and after installation for minimum of 24 hours.

## **PART 2 - PRODUCTS**

### **2.1 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION**

- A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E 84, NFPA 255, or UL 723.

### **2.2 GLASS FIBER**

- A. Manufacturers:



## SECTION 220719 - PLUMBING PIPING INSULATION

1. Knauf Insulation: [www.knaufusa.com](http://www.knaufusa.com).
  2. Johns Manville Corporation: [www.jm.com](http://www.jm.com).
  3. Owens Corning Corp: [www.owenscorning.com](http://www.owenscorning.com).
  4. CertainTeed Corporation; [www.certainteed.com](http://www.certainteed.com).
  5. Substitutions: See Section 016000 - Product Requirements.
- B. Insulation: ASTM C 547 and ASTM C 795; rigid molded, noncombustible.
1. 'K' value: ASTM C 177, 0.24 at 75 degrees F.
  2. Maximum service temperature: 850 degrees F.
  3. Maximum moisture absorption: 0.2 percent by volume.
- C. Insulation: ASTM C 547 and ASTM C 795; semi-rigid, noncombustible, end grain adhered to jacket.
1. 'K' value: ASTM C 177, 0.24 at 75 degrees F.
  2. Maximum service temperature: 650 degrees F.
  3. Maximum moisture absorption: 0.2 percent by volume.
- D. Vapor Barrier Jacket: White kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E 96/E 96M of 0.02 perm-inches.
- E. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

### 2.3 JACKETS

- A. PVC Plastic.
1. Manufacturers:
    - a. Johns Manville Corporation; [www.jm.com](http://www.jm.com).
    - b. Substitutions: See Section 016000 - Product Requirements.
  2. Jacket: One piece molded type fitting covers and sheet material, off-white color.
    - a. Minimum Service Temperature: 0 degrees F.
    - b. Maximum Service Temperature: 150 degrees F.
    - c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E 96/E 96M.
    - d. Thickness: 10 mil.
    - e. Connections: Brush on welding adhesive.

## **SECTION 220719 - PLUMBING PIPING INSULATION**

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Verify that piping has been tested before applying insulation materials.
- B. Verify that surfaces are clean and dry, with foreign material removed.

#### **3.2 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NAIMA National Insulation Standards.
- C. Exposed Piping: Locate insulation and cover seams in least visible locations.
- D. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
- E. Glass fiber insulated pipes conveying fluids below ambient temperature:
  - 1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
  - 2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.
- F. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.
- G. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.
- H. Glass fiber insulated pipes conveying fluids above ambient temperature:
  - 1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
  - 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
- I. Inserts and Shields:
  - 1. Application: Piping 1-1/2 inches diameter or larger.
  - 2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
  - 3. Insert location: Between support shield and piping and under the finish jacket.

## SECTION 220719 - PLUMBING PIPING INSULATION

4. Insert configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
  5. Insert material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.
- J. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 07 8400.
- K. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with canvas or aluminum jacket sized for finish painting.

### 3.3 SCHEDULES

#### A. Plumbing Systems:

1. Domestic Hot and Cold Water Supply:
  - a. Glass Fiber Insulation:
    - 1) Pipe Size Range: all sizes.
    - 2) Thickness: 1-1/2 inch.
2. Domestic Hot Water Recirculation:
  - a. Glass Fiber Insulation:
    - 1) Pipe Size Range: All sizes.
    - 2) Thickness: 1 inch.
3. Roof Drain Bodies:
  - a. Glass Fiber Insulation:
    - 1) Pipe Size Range: all sizes.
    - 2) Thickness: 1-1/2 inch.
4. Roof Drainage:
  - a. Glass Fiber Insulation:
    - 1) Pipe Size Range: all sizes.
    - 2) Thickness: 1-1/2 inch.
5. Plumbing Vents Within 5 Feet of the Exterior:
  - a. Glass Fiber Insulation:
    - 1) Pipe Size Range: all sizes.
    - 2) Thickness: 1-1/2 inch.

## **SECTION 220719 - PLUMBING PIPING INSULATION**

### **B. Heating Systems:**

#### **1. Heating Water Supply and Return:**

##### **a. Glass Fiber Insulation:**

- 1) Pipe Size Range: all sizes.**
- 2) Thickness: 1-1/2 inch.**

### **C. Cooling Systems:**

#### **1. Chilled Water:**

##### **a. Glass Fiber Insulation:**

- 1) Pipe Size Range: all sizes.**
- 2) Thickness: 1-1/2 inch.**

#### **2. Condensate Drains from Cooling Coils: None.**

**END OF SECTION 220719**

## **SECTION 221005 - PLUMBING PIPING**

### **PART 1 - GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Pipe, pipe fittings, valves, and connections for piping systems.
  - 1. Sanitary sewer.
  - 2. Domestic water.
  - 3. Storm water.

#### **1.2 RELATED REQUIREMENTS**

- A. Section 078413 – Penetration Firestopping.
- B. Section 078123 – Intumescent Mastic Fireproofing
- C. Section 083113 - Access Doors and Panels.
- D. Section 099123 - Painting and Coating.
- E. Section 220553 - Identification for Plumbing Piping and Equipment.
- E. Section 220719 - Plumbing Piping Insulation.

#### **1.3 REFERENCE STANDARDS**

- A. ANSI Z21.22 - American National Standard for Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems; 1999, and addenda A&B (R2004).
- B. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers; 2001 (R2005) (ANSI B16.18).
- C. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers; 2001 (R2005).
- D. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings - DWV; The American Society of Mechanical Engineers; 2002.
- E. ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes; The American Society of Mechanical Engineers; 2006.
- F. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV; The American Society of Mechanical Engineers; 2007.
- G. ASME B31.9 - Building Services Piping; The American Society of Mechanical Engineers; 2004 (ANSI/ASME B31.9).

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- H. ASTM A 74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2006.
- I. ASTM B 32 - Standard Specification for Solder Metal; 2004.
- L. ASTM B 42 - Standard Specification for Seamless Copper Pipe, Standard Sizes; 2002.
- M. ASTM B 68 - Standard Specification for Seamless Copper Tube, Bright Annealed; 2002.
- N. ASTM B 75 - Standard Specification for Seamless Copper Tube; 2002.
- O. ASTM B 88 - Standard Specification for Seamless Copper Water Tube; 2003.
- P. ASTM B 302 - Standard Specification for Threadless Copper Pipe, Standard Sizes; 2007.
- Q. ASTM B 306 - Standard Specification for Copper Drainage Tube (DWV); 2002.
- R. ASTM C 564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2003a.
- S. AWWA C651 - Disinfecting Water Mains; American Water Works Association; 2005 (ANSI/AWWA C651).
- T. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Distribution; American Water Works Association; 2007 (ANSI/AWWA C900).
- U. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications; Cast Iron Soil Pipe Institute; 2005.
- V. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; Cast Iron Soil Pipe Institute; 2004.
- W. MSS SP-58 - Pipe Hangers and Supports - Materials, Design and Manufacture; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2009.
- X. MSS SP-69 - Pipe Hangers and Supports - Selection and Application; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2003.
- Y. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2003.
- Z. MSS SP-89 - Pipe Hangers and Supports - Fabrication and Installation Practices; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2003.
- AA. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 1996.

### 1.4 SUBMITTALS

## **SECTION 221005 - PLUMBING PIPING**

- A. See Section 013300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.
- C. Project Record Documents: Record actual locations of valves.
- D. Maintenance Materials: Furnish the following for City and Borough of Juneau's use in maintenance of project.
  - 1. See Section 016000 - Product Requirements, for additional provisions.
  - 2. Valve Repacking Kits: One for each type and size of valve.

### **1.5 QUALITY ASSURANCE**

- A. Perform Work in accordance with State of Alaska, standards.
  - 1. Maintain one copy on project site.
- B. Valves: Manufacturer's name and pressure rating marked on valve body.
- C. Welding Materials and Procedures: Conform to ASME (BPV IX) and applicable state labor regulations.
- D. Welder Qualifications: Certified in accordance with ASME (BPV IX).
- E. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

### **1.6 REGULATORY REQUIREMENTS**

- A. Perform Work in accordance with State of Alaska plumbing code.
- B. Conform to applicable code for installation of backflow prevention devices.
- C. Provide certificate of compliance from authority having jurisdiction indicating approval of installation of backflow prevention devices.

### **1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Particular care shall be taken in storage and handling of such materials to maintain its clean condition. Provide temporary end caps and closures on piping and fittings until ready for immediate use. Maintain in place until installation. Store piping and equipment in clean, enclosed from weather, location at all times. Materials are not to be stored in direct contact with dirty surfaces or on dirt floor. If piping, equipment, and components are found to be improperly stored they shall be removed from the project immediately and new, clean materials shall be used.
- B. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

## **SECTION 221005 - PLUMBING PIPING**

- C. Provide temporary protective coating on cast iron and steel valves.
- D. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- E. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

### **1.8 FIELD CONDITIONS**

- A. Do not install underground piping when bedding is wet or frozen.

## **PART 2 - PRODUCTS**

### **2.1 SANITARY SEWER PIPING, ABOVE GRADE**

- A. Cast Iron Pipe: ASTM A 74, service weight.
  - 1. Fittings: Cast iron.
  - 2. Joint Seals: ASTM C 564 neoprene gaskets, or lead and oakum.
- B. Cast Iron Pipe: CISPI 301, hubless, service weight.
  - 1. Fittings: Cast iron.
  - 2. Joints: CISPI 310, neoprene gaskets and heavy duty stainless steel clamp-and-shield assemblies.

### **2.2 WATER PIPING, ABOVE GRADE**

- A. Copper Tube: ASTM B 88 (ASTM B 88M), Type L (B), Drawn (H).
  - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
  - 2. Joints: ASTM B 32, alloy Sn95 solder.
  - 3. Propress type fittings are acceptable.

### **2.3 STORM WATER PIPING, ABOVE GRADE**

- A. Cast Iron Pipe: ASTM A 74 extra heavy weight.
  - 1. Fittings: Cast iron.
  - 2. Joint Seals: ASTM C 564 neoprene gaskets, or lead and oakum.
- B. Cast Iron Pipe: CISPI 301, hubless, service weight.
  - 1. Fittings: Cast iron.
  - 2. Joints: Neoprene gaskets and heavy duty stainless steel clamp-and-shield assemblies.



## SECTION 221005 - PLUMBING PIPING

### 2.4 FLANGES, UNIONS, AND COUPLINGS

#### A. Unions for Pipe Sizes 3 Inches and Under:

1. Ferrous pipe: Class 150 malleable iron threaded unions.
2. Copper tube and pipe: Class 150 bronze unions with soldered joints.

#### B. Flanges for Pipe Size Over 1 Inch:

1. Ferrous pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
2. Copper tube and pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.

#### C. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

### 2.5 PIPE HANGERS AND SUPPORTS

#### A. Plumbing Piping - Drain, Waste, and Vent:

1. Conform to ASME B31.9.
2. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
3. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
5. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
6. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
7. Vertical Support: Steel riser clamp.
8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
9. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

#### B. Plumbing Piping - Water:

1. Conform to ASME B31.9.
2. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
3. Hangers for Cold Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
4. Hangers for Hot Pipe Sizes 2 Inches to 4 Inches: Carbon steel, adjustable, clevis.
5. Hangers for Hot Pipe Sizes 6 Inches and Over: Adjustable steel yoke, cast iron pipe roll, double hanger.
6. Multiple or Trapeze Hangers: Steel channels with welded supports or spacers and hanger rods.
7. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
8. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
9. Vertical Support: Steel riser clamp.
10. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

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11. Floor Support for Hot Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, locknut, nipple, floor flange, and concrete pier or steel support.
12. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

### 2.6 GATE VALVES

#### A. Manufacturers:

1. Tyco Flow Control: [www.tycoflowcontrol.com](http://www.tycoflowcontrol.com).
2. Conbraco Industries: [www.conbraco.com](http://www.conbraco.com).
3. Nibco, Inc: [www.nibco.com](http://www.nibco.com).
4. Milwaukee Valve Company: [www.milwaukeevalve.com](http://www.milwaukeevalve.com).
5. Substitutions: See Section 016000 - Product Requirements.

#### B. Up To and Including 3 Inches:

1. MSS SP-80, Class 125, bronze body, bronze trim, rising stem, handwheel, inside screw, solid wedge disc, solder ends.

#### C. 2 Inches and Larger:

1. MSS SP-70, Class 125, iron body, bronze trim, outside screw and yoke, handwheel, solid wedge disc, flanged ends. Provide chain-wheel operators for valves 6 inches and larger mounted over 8 feet above floor.

### 2.7 BALL VALVES

#### A. Manufacturers:

1. Tyco Flow Control: [www.tycoflowcontrol.com](http://www.tycoflowcontrol.com).
2. Conbraco Industries: [www.conbraco.com](http://www.conbraco.com).
3. Nibco, Inc: [www.nibco.com](http://www.nibco.com).
4. Milwaukee Valve Company: [www.milwaukeevalve.com](http://www.milwaukeevalve.com).
5. Substitutions: See Section 016000 - Product Requirements.

- #### B. Construction, 4 Inches and Smaller:
- MSS SP-110, Class 150, 400 psi CWP, bronze, two piece body, chrome plated brass ball, full port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, solder ends with union.

### 2.8 FLOW SETTERS

#### A. Manufacturers:

1. ITT Bell & Gossett.
2. Griswold Controls.
3. Taco, Inc.

- #### B. Construction:
- Angle or straight pattern, inside screw globe or ball valve for 125 psig working

## SECTION 221005 - PLUMBING PIPING

pressure, with bronze body and integral union for screwed connections, renewable composition disc, plastic wheel handle for shut-off service, and lock-shield key cap and set screw memory bonnet for balancing service. ½ inch or ¾ inch may be sweat type ends. Valve bodies to have differential read-out port and caps. Provide three probe adapters for meter reading. Provide two spare read-out port caps.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Verify that excavations are to required grade, dry, and not over-excavated.

#### 3.2 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

#### 3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- D. Install piping to maintain headroom, conserve space, and not interfere with use of space.
- E. Group piping whenever practical at common elevations.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 220719.
- H. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with Section 083100.
- I. Install vent piping penetrating roofed areas to maintain integrity of roof assembly.
- J. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- K. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting.

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Refer to Section 099123.

- L. Install valves with stems upright or horizontal, not inverted.
- M. Install water piping to ASME B31.9.
- N. Sleeve pipes passing through partitions, walls and floors.
- O. Inserts:
  - 1. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.
- P. Pipe Hangers and Supports:
  - 1. Install in accordance with ASME B31.9.
  - 2. Support horizontal piping as scheduled.
  - 3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
  - 4. Place hangers within 12 inches of each horizontal elbow.
  - 5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
  - 6. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
  - 7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
  - 8. Provide copper plated hangers and supports for copper piping.
  - 9. Prime coat exposed steel hangers and supports. Refer to Section 09 9000. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
  - 10. Provide hangers adjacent to motor driven equipment with vibration isolation; refer to Section 22 0548.
  - 11. Support cast iron drainage piping at every joint.

### 3.4 APPLICATION

- A. Install unions downstream of valves and at equipment or apparatus connections.
- B. Install gate valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- C. Provide flow setter in water recirculating systems where indicated.

### 3.5 TOLERANCES

- A. Drainage Piping: Establish invert elevations within 1/2 inch vertically of location indicated and slope to drain at minimum of 1/4 inch per foot slope.
- B. Water Piping: Slope at minimum of 1/4 inch per foot and arrange to drain at low points.

## **SECTION 221005 - PLUMBING PIPING**

### **3.6 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM**

- A. Disinfect water distribution system in accordance with Section 331300.
- B. Prior to starting work, verify system is complete, flushed and clean.
- C. Ensure Ph of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
- D. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.
- E. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
- F. Maintain disinfectant in system for 24 hours.
- G. If final disinfectant residual tests less than 25 mg/L, repeat treatment.
- H. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.
- I. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

### **3.7 SCHEDULES**

- A. Pipe Hanger Spacing:
  - 1. Metal Piping:
    - a. Pipe size: 1/2 inches to 1-1/4 inches:
      - 1) Maximum hanger spacing: 6.5 ft.
      - 2) Hanger rod diameter: 3/8 inches.
    - b. Pipe size: 1-1/2 inches to 2 inches:
      - 1) Maximum hanger spacing: 10 ft.
      - 2) Hanger rod diameter: 3/8 inch.
    - c. Pipe size: 2-1/2 inches to 3 inches:
      - 1) Maximum hanger spacing: 10 ft.
      - 2) Hanger rod diameter: 1/2 inch.
    - d. Pipe size: 4 inches to 6 inches:
      - 1) Maximum hanger spacing: 10 ft.
      - 2) Hanger rod diameter: 5/8 inch.

**END OF SECTION 221005**

## **SECTION 221006 - PLUMBING PIPING SPECIALTIES**

### **PART 1 - GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Roof and floor drains.
- B. Cleanouts.
- C. Water hammer arrestors.
- D. Thermostatic mixing valves.

#### **1.2 RELATED REQUIREMENTS**

- A. Drawings and General provisions of the Contract, including General, Supplementary Conditions, and all Division Specifications Section, apply to this section.
- B. Section 221005 - Plumbing Piping.
- C. Section 224000 - Plumbing Fixtures.

#### **1.3 REFERENCE STANDARDS**

- A. ASME A112.6.3 - Floor and Trench Drains; The American Society of Mechanical Engineers; 2001 (R2007).
- B. ASSE 1012 - Backflow Preventer with Intermediate Atmospheric Vent; American Society of Sanitary Engineering; 2002 (ANSI/ASSE 1012).
- C. ASSE 1013 - Reduced Pressure Principle Backflow Preventers and Reduced Pressure Fire Protection Principle Backflow Preventers; American Society of Sanitary Engineering; 2005.
- D. ASSE 1019 - Vacuum Breaker Wall Hydrants, Freeze Resistant Automatic Draining Type; American Society of Sanitary Engineering; 2004, and Errata 2005 (ANSI/ASSE 1019).
- E. PDI-WH 201 - Water Hammer Arresters; Plumbing and Drainage Institute; 2006.

#### **1.4 SUBMITTALS**

- A. See Section 013300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.
- C. Manufacturer's Instructions: Indicate Manufacturer's Installation Instructions: Indicate assembly and support requirements.

## **SECTION 221006 - PLUMBING PIPING SPECIALTIES**

- D. Project Record Documents: Record actual locations of equipment, cleanouts, water hammer arrestors.
- E. Operation Data: Indicate frequency of treatment required for interceptors.
- F. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.
- G. Maintenance Materials: Furnish the following for City and Borough of Juneau's use in maintenance of project.
  - 1. See Section 016000 - Product Requirements, for additional provisions.

### **1.5 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years documented experience.

### **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Accept specialties on site in original factory packaging. Inspect for damage.

## **PART 2 - PRODUCTS**

### **2.1 DRAINS**

#### **A. Manufacturers:**

- 1. Josam Company: [www.josam.com](http://www.josam.com).
- 2. Jay R. Smith Manufacturing Company: [www.jayrsmith.com](http://www.jayrsmith.com).
- 3. Zurn Industries, Inc: [www.zurn.com](http://www.zurn.com).
- 4. Substitutions: See Section 016000 - Product Requirements.

#### **B. Roof Drains (RD-1):**

- 1. Assembly: ASME A112.6.4.
- 2. Body: Lacquered cast iron with sump.
- 3. Strainer: Removable polyethylene dome with vandal proof screws.
- 4. Accessories: Coordinate with roofing type.
  - a. Membrane flange and membrane clamp with integral gravel stop.
  - b. Adjustable under deck clamp.
  - c. Roof sump receiver.
  - d. Controlled flow weir.
  - e. Leveling frame.
  - f. Adjustable extension sleeve for roof insulation.

#### **C. Roof Overflow Drains (ORD-1):**

## **SECTION 221006 - PLUMBING PIPING SPECIALTIES**

1. Lacquered cast iron body and clamp collar and bottom clamp ring; pipe extended to 2 inches above flood elevation.

### **D. Downspout Nozzles (RLN-1)**

1. Bronze round with straight bottom section.

### **E. Floor Drain (D-1):**

1. ASME A112.6.3; lacquered cast iron two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze strainer.

### **F. Floor Sink (D-2):**

1. Square lacquered cast iron body with integral seepage pan, epoxy coated interior, aluminum dome strainer, sediment bucket, half grate.

### **G. See Schedules on Drawings for additional information.**

## **2.2 CLEANOUTS**

### **A. Manufacturers:**

1. Jay R. Smith Manufacturing Company: [www.jayrsmith.com](http://www.jayrsmith.com).
2. Josam Company: [www.josam.com](http://www.josam.com).
3. Zurn Industries, Inc: [www.zurn.com](http://www.zurn.com).
4. Substitutions: See Section 016000 - Product Requirements.

### **B. Cleanouts at Interior Finished Floor Areas:**

1. Lacquered cast iron body with anchor flange, reversible clamping collar, threaded top assembly, and round gasketed scored cover in service areas and round gasketed depressed cover to accept floor finish in finished floor areas.

### **C. Cleanouts at Interior Finished Wall Areas:**

1. Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.

### **D. Cleanouts at Interior Unfinished Accessible Areas: Calked or threaded type. Provide bolted stack cleanouts on vertical rainwater leaders.**



## SECTION 221006 - PLUMBING PIPING SPECIALTIES

### 2.3 REFRIGERATOR/ICE MAKER VALVE AND RECESSED BOX

#### A. Box Manufacturers:

1. IPS Corporation/Water-Tite: [www.ipscorp.com](http://www.ipscorp.com).
2. Oatey: [www.oatey.com](http://www.oatey.com).
3. Substitutions: See Section 016000 - Product Requirements.

#### B. Valve Manufacturers:

1. IPS Corporation/Water-Tite: [www.ipscorp.com](http://www.ipscorp.com).
2. Zurn Industries, Inc: [www.zurn.com](http://www.zurn.com).
3. Substitutions: See Section 016000 - Product Requirements.

#### C. Description: Plastic preformed rough-in box with brass valves with wheel handle, slip in finishing cover.

### 2.4 WATER HAMMER ARRESTORS

#### A. Manufacturers:

1. Jay R. Smith Manufacturing Company: [www.jayrsmith.com](http://www.jayrsmith.com).
2. Watts Regulator Company: [www.wattsregulator.com](http://www.wattsregulator.com).
3. Zurn Industries, Inc: [www.zurn.com](http://www.zurn.com).
4. Substitutions: See Section 016000 - Product Requirements.

#### B. Water Hammer Arrestors:

1. Stainless steel construction, bellows type sized in accordance with PDI-WH 201, pre-charged suitable for operation in temperature range -100 to 300 degrees F and maximum 250 psi working pressure.

### 2.5 PRESSURE BALANCED MIXING VALVES:

#### 1. Manufacturers:

- a. Delta Faucet Company: [www.deltafaucet.com](http://www.deltafaucet.com).
- b. H.G. Specialties: [www.hgspec.com](http://www.hgspec.com).
- c. Taconova: [www.taconova.co.uk](http://www.taconova.co.uk).
- d. Substitutions: See Section 016000 - Product Requirements.

#### 2. Valve: Chrome plated cast brass body, stainless steel cylinder, integral temperature adjustment.

#### 3. Accessories:

- a. Volume control shut-off valve on outlet.

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- b. Stem thermometer on outlet.
- c. Strainer stop checks on inlets.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.
- C. Install floor cleanouts at elevation to accommodate finished floor.
- D. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to lavatories, sinks.

**END OF SECTION 221006**

## **SECTION 224000 - PLUMBING FIXTURES**

### **PART 1 - GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Water closets.
- B. Lavatories.
- C. Sinks.
- D. Showers.

#### **1.2 RELATED REQUIREMENTS**

- A. Section 011000 - Summary: Product requirements for City and Borough of Juneau furnished fixtures.
- B. Section 123550 - Architectural Wood Casework: Preparation of counters for sinks; lavatory tops.
- C. Section 079200 - Joint Sealers: Seal fixtures to walls and floors.
- D. Section 221005 - Plumbing Piping.
- E. Section 221006 - Plumbing Piping Specialties.
- F. Drawings and General provisions of the Contract, including General, Supplementary Conditions, and all Division Specifications Section, apply to this section.

#### **1.3 REFERENCE STANDARDS**

- A. ANSI Z124.1.2 - American National Standard for Plastic Bathtub and Shower Units; 2005.
- B. ASME A112.6.1M - Supports for Off-the-Floor Plumbing Fixtures for Public Use; The American Society of Mechanical Engineers; 1997 (Reaffirmed 2002).
- C. ASME A112.18.1 - Plumbing Supply Fittings; The American Society of Mechanical Engineers; 2005.
- D. ASME A112.19.1M - Enameled Cast Iron Plumbing Fixtures; The American Society of Mechanical Engineers; 1994 (R2004).
- E. ASME A112.19.2 - Vitreous China Plumbing Fixtures and Hydraulic Requirements for Water Closets and Urinals; The American Society of Mechanical Engineers; 2003.
- F. ASME A112.19.3 - Stainless Steel Plumbing Fixtures (Designed for Residential Use); The American Society of Mechanical Engineers; 2001 (R2004).

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- G. ASME A112.19.5 - Trim for Water-Closet Bowls, Tanks and Urinals; The American Society of Mechanical Engineers; 2005.

### **1.4 SUBMITTALS**

- A. See Section 013300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.
- C. Manufacturer's Instructions: Indicate installation methods and procedures.
- D. Maintenance Data: Include fixture trim exploded view and replacement parts lists.
- E. Warranty: Submit manufacturer warranty and ensure forms have been completed in City and Borough of Juneau's name and registered with manufacturer.
- F. Maintenance Materials: Furnish the following for City and Borough of Juneau's use in maintenance of project.
  - 1. See Section 016000 - Product Requirements, for additional provisions.
  - 2. Extra Faucet Washers: One set of each type and size.
  - 3. Two complete electronic faucet assemblies in original packaging, P-34 and P-43.
  - 4. Extra Shower Heads: One of each type and size.
  - 5. Extra Toilet Seats: One of each type and size.
  - 6. Flush Valve Service Kits: One for each type and size.
  - 7. Sink Faucets: Provide four spare faucet cartridges.

### **1.5 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

### **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Accept fixtures on site in factory packaging. Inspect for damage.
- B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

### **1.8 WARRANTY**

- A. See Section 017700 - Closeout Submittals, for additional warranty requirements.

## SECTION 224000 - PLUMBING FIXTURES

### PART 2 - PRODUCTS

#### 2.1 FLUSH VALVE WATER CLOSETS, P-1, P-2.

- A. Water Closets: Vitreous china, ASME A112.19.2, elongated rim, wall hung, siphon jet flush action, china bolt caps.
  - 1. Flush Volume: 1.6 gallon, maximum.
  - 2. Flush Valve: Exposed (top spud).
  - 3. Flush Operation: Sensor Operated.
  - 4. Supply Size: 1-1/2 inches.
  - 5. Outlet Size: 4 inches.
  - 6. Manufacturers:
    - a. American Standard Inc; [www.americanstandard.com](http://www.americanstandard.com).
    - b. Kohler Company; [www.kohler.com](http://www.kohler.com).
    - c. Zurn industries, Inc; [www.zurn.com](http://www.zurn.com).
- B. Flush Valves: ASME A112.18.1, diaphragm type, complete with vacuum breaker stops and accessories.
  - 1. Sensor-Operated Type: Solenoid operator, battery powered, infrared sensor and over-ride push button.
  - 2. Bed Pan Washer: P-2 Only.
  - 3. Manufacturers:
    - a. Sloan Valve Company: [www.sloanvalve.com](http://www.sloanvalve.com).
    - b. Zurn Industries, Inc: [www.zurn.com](http://www.zurn.com).
- C. Seats:
  - 1. Manufacturers:
    - a. Bemis Manufacturing Company: [www.bemismfg.com](http://www.bemismfg.com).
    - b. Church Seat Company: [www.churchseats.com](http://www.churchseats.com).
    - c. Olsonite: [www.olsonite.com](http://www.olsonite.com).
    - d. Zurn industries, Inc; [www.zurn.com](http://www.zurn.com).
  - 2. Solid white plastic, open front, extended back, self-sustaining hinge, brass bolts, without cover.
- D. Water Closet Carriers:
  - 1. Manufacturers:
    - a. JOSAM Company: [www.josam.com](http://www.josam.com).
    - b. Zurn Industries, Inc: [www.zurn.com](http://www.zurn.com).

## SECTION 224000 - PLUMBING FIXTURES

### 2.1 FLUSH VALVE BARIATRIC WATER CLOSETS, P-3

- A. Water Closets: Vitreous china, ASME A112.19.2, elongated rim, floor mounted, siphon jet flush action, china bolt caps. Extra heavy duty 1000 lb Bariatric Water Closet.
  - 1. Flush Volume: 1.6 gallon, maximum.
  - 2. Flush Valve: Exposed (top spud).
  - 3. Flush Operation: Sensor Operated.
  - 4. Supply Size: 1-1/2 inches.
  - 5. Outlet Size: 4 inches.
  - 6. Manufacturers:
    - a. American Standard Inc; [www.americanstandard.com](http://www.americanstandard.com).
    - b. Kohler Company; [www.kohler.com](http://www.kohler.com).
    - c. Zurn industries, Inc; [www.zurn.com](http://www.zurn.com).
- B. Flush Valves: ASME A112.18.1, diaphragm type, complete with vacuum breaker stops and accessories.
  - 1. Sensor-Operated Type: Solenoid operator, battery powered, infrared sensor and over-ride push button. Suitable for bariatric fixture.
  - 2. Manufacturers:
    - a. Sloan Valve Company: [www.sloanvalve.com](http://www.sloanvalve.com).
    - b. Zurn Industries, Inc: [www.zurn.com](http://www.zurn.com).
- C. Seats:
  - 1. Manufacturers:
    - a. Bemis Manufacturing Company: [www.bemismfg.com](http://www.bemismfg.com).
    - b. Church Seat Company: [www.churchseats.com](http://www.churchseats.com).
    - c. Olsonite: [www.olsonite.com](http://www.olsonite.com).
    - d. Zurn industries, Inc; [www.zurn.com](http://www.zurn.com).
  - 2. Solid white plastic, Bariatric extra large and elongated seat. Ergonomic extra wide seat. Provide extra seat.

### 2.3 LAVATORIES

- A. Lavatory Manufacturers:
  - 1. American Standard Inc: [www.americanstandard.com](http://www.americanstandard.com).
  - 2. Kohler Company: [www.kohler.com](http://www.kohler.com).
  - 3. Zurn industries, Inc: [www.zurn.com](http://www.zurn.com).
  - 4. Substitutions: See Section 016000 - Product Requirements.
- B. Vitreous China Wall Hung Basin (P-34): ASME A112.19.2; vitreous china wall hung lavatory, 22 by 18 inch minimum, with 4 inch high back, rectangular basin with splash lip, front overflow, and soap depression.

## SECTION 224000 - PLUMBING FIXTURES

1. Drilling Centers: 8 inch.
- C. Vitreous China Counter Top Basin (P-43): ASME A112.19.2; vitreous china self-rimming counter top lavatory, 20-1/2 by 17-1/2 inch with drillings on 8 inch centers, front overflow, soap depression, seal of putty, calking, or concealed vinyl gasket.
- D. Supply Faucet Manufacturers:
  1. American Standard Inc: [www.americanstandard.com](http://www.americanstandard.com).
  2. Kohler Company: [www.kohler.com](http://www.kohler.com).
  3. Zurn industries, Inc: [www.zurn.com](http://www.zurn.com).
  4. Substitutions: See Section 016000 - Product Requirements.
- E. Metered Faucet: ASME A112.18.1; chrome plated metered mixing faucet with battery operated solenoid operator and infrared sensor, aerator and cover plate, open grid strainer. Cast brass, chrome plated, deck mounted with sensor located on neck of spout.
  1. Spout Style: Standard.
  2. Power Supply: Battery, easily replaceable, alkaline or lithium, minimum 200,000 cycles.
  3. Mixing Valve: External lever operated.
  4. Water Supply: 3/8 inch compression connections.
  5. Aerator: Vandal resistant, 0.5 GPM, laminar flow device.
  6. Finish: Polished chrome.
  7. Sensor Operated Faucet Manufacturers:
    - a. Advanced Modern Technologies Corporation; [www.amtcorporation.com](http://www.amtcorporation.com).
    - b. American Standard Inc; [www.americanstandard.com](http://www.americanstandard.com).
    - c. Gerber Plumbing Fixtures LLC; [www.gerberonline.com](http://www.gerberonline.com).
    - d. The Chicago Faucet Company; [www.chicagofaucets.com](http://www.chicagofaucets.com).
    - e. Sloan Valve Company; [www.sloanvalve.com](http://www.sloanvalve.com).
    - f. Zurn industries, Inc; [www.zurn.com](http://www.zurn.com).
    - g. Speakman.
- G. Accessories:
  1. Chrome plated 17 gage brass P-trap with clean-out plug and arm with escutcheon.
  2. Offset waste with perforated open strainer.
  3. Wheel handle stops.
  4. Rigid supplies.
  5. Carrier:
    - a. Manufacturers:
      - 1) JOSAM Company: [www.josam.com](http://www.josam.com).
      - 2) Zurn Industries, Inc: [www.zurn.com](http://www.zurn.com).
      - 3) Substitutions: See Section 016000 - Product Requirements.
    - b. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded studs for fixture hanger, bearing plate and studs.

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### 2.3 SINKS (P-9)

#### A. Sink Manufacturers:

1. American Standard Inc: [www.americanstandard.com](http://www.americanstandard.com).
2. Kohler Company: [www.kohler.com](http://www.kohler.com).
3. Elkay
4. Just
5. Substitutions: See Section 016000 - Product Requirements.

#### B. Single Compartment Bowl: ASME A112.19.3; 22 by 19-1/2 by 6-1/2 inch outside dimensions 20 gage thick, Type 302 stainless steel, self rimming and undercoated, with ledge back drilled for trim.

1. Drain: 3-1/2 inch crumb cup and tailpiece.

#### C. Trim for sinks: ASME A112.18.1; concealed chrome plated brass supply with swivel gooseneck faucet (5-1/2 inch reach, 9-inch deck to aerator) and water economy softflo aerator with maximum 2.0 gpm flow, indexed 4 inch wrist blade handles. 8 inch centers. flexible metal braided supplies and quarter turn ball valve stops with threaded connections.

#### D. Chrome plated 17 gauge brass P-trap with clean out plug and arm with escutcheon. ADA offset. Insulation shields on plumbing piping for ADA compliance where exposed.

### 2.4 SHOWERS (P-32, P-33)

#### A. Shower Manufacturers:

1. Aquabath
2. Lasco
3. Jacuzzi: [www.jacuzzi.com](http://www.jacuzzi.com).
4. Kohler Company: [www.kohler.com](http://www.kohler.com).
5. Substitutions: See Section 01 6000 - Product Requirements.

#### B. Cabinet: ANSI Z124.1.2 molded cast acrylic, 36 by 36 by 77 inches with integral receptor, soap dish, integral seat, removable chrome plated strainer, tail piece, color as selected by Architect. Provide anti-bacterial curtain, hooks, and rod. Removable dam at entrance.

#### C. Trim: ASME A112.18.1; concealed shower supply with pressure balanced mixing valves, integral service stops, bent shower arm with flow control and adjustable spray ball joint shower head with maximum flow, and escutcheon.

#### D. Shower Head:

1. ASME A112.18.1; chrome plated vandal-proof institutional head with integral wall bracket, built-in 2.5 gpm flow control. P-33 with extended hose.

#### E. Adjustable slide bar shower head.



## **SECTION 224000 - PLUMBING FIXTURES**

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.
- B. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

#### **3.2 PREPARATION**

- A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

#### **3.3 INSTALLATION**

- A. Install each fixture with trap, easily removable for servicing and cleaning.
- B. Provide chrome plated rigid or flexible supplies to fixtures with screwdriver stops, reducers, and escutcheons.
- C. Install components level and plumb.
- D. Install and secure fixtures in place with wall supports and bolts.
- E. Seal fixtures to wall and floor surfaces with sealant as specified in Section 079005, color to match fixture.
- F. Solidly attach water closets to floor with lag screws. Lead flashing is not intended hold fixture in place.

#### **3.4 INTERFACE WITH WORK OF OTHER SECTIONS**

- A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

#### **3.5 ADJUSTING**

- A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

#### **3.6 CLEANING**

- A. Clean plumbing fixtures and equipment.

## **SECTION 224000 - PLUMBING FIXTURES**

### **3.7 PROTECTION**

- A. Protect installed products from damage due to subsequent construction operations.
- B. Do not permit use of fixtures by construction personnel.
- C. Repair or replace damaged products before Date of Substantial Completion.

**END OF SECTION 224000**

## **SECTION 226005 - MEDICAL AIR, GAS, AND VACUUM SYSTEMS**

### **PART 1 - GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Medical oxygen gas system.
- B. Medical compressed air system.
- C. Medical vacuum system.

#### **1.2 RELATED REQUIREMENTS**

- A. Drawings and General provisions of the Contract, including General, Supplementary Conditions, and all Division Specifications Section, apply to this section.
- B. Section 220553 - Identification for Plumbing Piping and Equipment.
- C. Section 220719 - Plumbing Piping Insulation.
- D. Section 262726 – Wiring Devices: Electrical characteristics and wiring connections.

#### **1.3 REFERENCE STANDARDS**

- A. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers; 2001 (R2005) (ANSI B16.18).
- B. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers; 2001 (R2005).
- C. ASME B40.100 - Pressure Gauges and Gauge Attachments; The American Society of Mechanical Engineers; 2005.
- D. ASME (BPV) - Boiler and Pressure Vessel Code; The American Society of Mechanical Engineers; 2007.
- E. ASTM B 32 - Standard Specification for Solder Metal; 2004.
- F. ASTM B 88 - Standard Specification for Seamless Copper Water Tube; 2003.
- G. ASTM B 819 - Standard Specification for Seamless Copper Tube for Medical Gas Systems; 2000 (Reapproved 2006).
- H. AWS A5.8/A5.8M - Specification for Filler Metals for Brazing and Braze Welding; American Welding Society; 2004 and errata.
- I. CGA G-7 - Compressed Air for Human Respiration; Compressed Gas Association; 2008.

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- J. CGA V-5 - Diameter-Index Safety System (Noninterchangeable Low Pressure Connections for Medical Gas Applications); Compressed Gas Association; 2008.
- K. MSS SP-58 - Pipe Hangers and Supports - Materials, Design and Manufacture; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2009.
- L. MSS SP-69 - Pipe Hangers and Supports - Selection and Application; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2003.
- N. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2003.
- M. MSS SP-88 - Diaphragm Type Valves; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 1993 (R 2001).
- O. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 1996.
- P. NFPA 99 - Standard for Health Care Facilities; National Fire Protection Association; 2005.

### **1.4 SUBMITTALS**

- A. See Section 013300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturers literature and illustrations for all components indicating size, dimensions and configuration.
- C. Shop Drawings: Indicate general assembly of components, mounting and installation details, and general layout of control and alarm panels. Submit detailed medical wall assembly drawings.
- D. Test Reports:
  - 1. Independent Testing Agency Reports: Indicate systems are complete, zone valves installed, alarm systems functional, and pressure and cross connections tests performed. Document tests.
  - 2. Certificates: Certify that Products meet or exceed specified requirements.
  - 3. Manufacturer's Instructions: Indicate installation requirements for equipment and systems.
  - 4. Manufacturer's Field Reports: Indicate systems are complete, zone valves installed, and alarm systems functional.
- I. Project Record Documents: Record actual locations of piping, valving, and outlets.
- J. Operation Data: Include installation instructions, assembly views, lubrication instructions, and assembly views.

## **SECTION 226005 - MEDICAL AIR, GAS, AND VACUUM SYSTEMS**

- K. Maintenance Data: Include maintenance and inspection data, replacement part numbers and availability, and service depot location and telephone.
- L. Warranty: Submit manufacturer warranty and ensure forms have been completed in City and Borough of Juneau's name and registered with manufacturer.
- M. Maintenance Materials: Furnish the following for City and Borough of Juneau's use in maintenance of project.
  - 1. See Section 016000 - Product Requirements, for additional provisions.
  - 2. Extra Valves: One of each type and size.

### **1.5 QUALITY ASSURANCE**

- A. Perform Work in accordance with NFPA 99.
- B. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.
- C. Installer Qualifications: Company specializing in performing the work of this section with minimum 3 years of experience.
- D. Testing Laboratory: Company specializing in performing testing of the type specified in this section, with minimum 3 years of documented experience.
- E. Conform to applicable code for medical gas systems.
- F. Provide certificate of compliance from authority having jurisdiction, indicating approval of systems.
- G. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

### **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Accept material on site in factory containers and packing. Inspect for damage.
- B. Protect from damage and contamination by maintaining factory packaging and caps in place until installation.

### **1.7 WARRANTY**

- A. See Section 017700 - Closeout Submittals, for additional warranty requirements.

## SECTION 226005 - MEDICAL AIR, GAS, AND VACUUM SYSTEMS

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Allied Healthcare Products, Inc; [www.alliedhpi.com](http://www.alliedhpi.com).
- B. Amico Corporation; [www.amico.com](http://www.amico.com).
- C. BeaconMedaes; [www.beaconmedical.com](http://www.beaconmedical.com).
- D. Substitutions: See Section 016000 - Product Requirements.

#### 2.2 PIPE AND FITTINGS

- A. Factory Preparation: Wash inside of copper pipe and copper fitting with hot solution of sodium carbonate or trisodium phosphate mixed 1 lb to 3 gal of water; rinse with water, and blow dry with oil-free dry nitrogen or compressed air.
- B. Oxygen, Compressed Air, Aboveground:
  - 1. Copper Tube: ASTM B 88, Type K (A), drawn.
  - 2. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper.
  - 3. Joints: AWS A5.8 Classification BCuP-3 or BCuP-4 silver braze.
- C. Vacuum and Anesthesia Gas Evacuation Systems, Aboveground:
  - 1. Copper Tube: ASTM B 88 (ASTM B 88M), Type L (B), drawn.
  - 2. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper.
  - 3. Joints: AWS A5.8 Classification BCuP-3 or BCuP-4 silver braze or ASTM B 32, solder, Grade Sn95.

#### 2.3 VALVES

- A. Factory Preparation for Oxygen Service: Disassemble, clean, degrease, seal, and pack for shipping.
- B. Ball Valves:
  - 1. Requirements: Comply with MSS SP-110; bronze body, three piece, double-seal ball valves with replaceable neoprene or teflon seat and stem seals, for minimum 600 psi cold working pressure, flange or union mounting, labeled for intended service.
- C. Diaphragm Valves (Oxygen):
  - 1. MSS SP-88, brass-bodied, packless, diaphragm type with regrinding or renewable seats and disks, for minimum 300 psi working pressure.
- D. Gate Valves (Vacuum, Medical Air System):

## **SECTION 226005 - MEDICAL AIR, GAS, AND VACUUM SYSTEMS**

1. MSS SP-80; Class 150 bronze body, bronze trim, rising stem, handwheel, inside screw, solid wedge disc, solder ends.

### **2.4 PIPING ACCESSORIES**

- A. Hangers and Supports: MSS SP-58 with types as required by MSS SP-69.
- B. Pressure Gages:
  1. ASME B40.100, white dials and black lettering with restrictor.
  2. Oxygen systems: Manufactured and labeled expressly for intended service; UL labeled.
- C. Flexible Connectors: Corrugated flexible, single ply, seamless or seam-welded tubing of stainless steel or bronze or reinforced teflon bellows or hose.
- D. Valve Cabinets:
  1. Extruded aluminum, flush-mounted and rigidly assembled to accommodate valves and fittings, punched or drilled sides to receive tubing, anchors to secure to wall construction.
  2. Cover Plates: Extruded aluminum, with replaceable plastic windows with pull ring to remove window.
  3. Cabinet Labels: Labeled and color coded for intended service and area served.
  4. Valves: Pre-assemble and mount chrome plated valves and tubing extensions.
  5. Gages: Provide where indicated and in operating rooms areas downstream of isolating valves.
- E. Piping Identification: Pressure sensitive adhesive tape and decals, color and labeling to conform with Section 22 0553.

### **2.5 OUTLETS**

- A. Outlet Units: Owner furnished, Contractor installed.
  1. Manufacturers:
    - a. Allied Healthcare Products, Inc; [www.alliedhpi.com](http://www.alliedhpi.com).
    - b. Amico Corporation; [www.amico.com](http://www.amico.com).
    - c. BeaconMedaes; [www.beaconmedical.com](http://www.beaconmedical.com).
  2. CGA V-5, Diameter-Index Safety System (DISS) non-interchangeable connectors, automatic valves, secondary check valves (except vacuum and evacuation outlets), and capped 3/8 inch tubing stubs for supply connections, color coded and labeled for intended service.
- B. Faceplates:
  1. Flush Outlets: Mount in galvanized steel boxes with stainless steel faceplate with Lexan cover, color coded with embossed labeling.

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2. Surface Outlets: Surface mount with color coded plastic cover and stainless steel faceplate with Lexan cover, color coded with embossed labeling.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION**

- A. Install in accordance with NFPA 99.
- B. Pre-Installation Cleaning: Disassemble positive pressure gas systems pipe, fittings, valves, and components, except those supplied cleaned and prepared for intended service, and thoroughly wash in hot solution of sodium carbonate or trisodium phosphate mixed 1 lb to 3 gal of water. After washing, rinse with water, dry and cap until installation.
- C. Braze joints in pipe and tubing. Avoid leaving excess flux inside of pipe and fittings. During brazing of pipe connections, purge interior of pipe continuously with nitrogen.
- D. Effect changes in size with reducing fittings. Make changes in direction of required turns or offsets with fittings or tubing shaped by bending tools. Make bends free of flattening, buckling or thinning of tube wall.
- E. Cut pipe and tubing accurately and install without springing or forcing.
- F. Install exposed oxygen piping in wall-mounted sheet steel raceways and junction boxes.
- G. Grade piping down in direction of flow.
- H. Identify piping with tape and decals. Provide piping identification code and schematic for installation under provisions of Section 22 0553. Install labeling on pipe at intervals of not more than 20 feet and at least once in each room and each story traversed by pipeline.

#### **3.2 PIPING SYSTEMS CLEANING AND PRESSURE TESTING**

- A. After erection of pipe and tubing but prior to installation of service outlet valves, blow systems clear of free moisture and foreign matter with nitrogen gas.
- B. Install service outlet valves, subject system to test pressure of 150 psi with nitrogen or dry compressed air. Check with soapy water. Provide 24-hour standing pressure test.

#### **3.3 FIELD QUALITY CONTROL**

- A. Independent testing agency to certify system is complete, zone valves installed, alarm systems functional, and tests performed. Document tests and submit.
- B. Reduce pressure in piping systems other than system under investigation to atmospheric.
- C. Test system with dry compressed air or dry nitrogen with test pressure in piping system at 50



## **SECTION 226005 - MEDICAL AIR, GAS, AND VACUUM SYSTEMS**

psi.

- D. Check each station outlet of every piping system to determine test gas is dispensed only from outlet of system under investigation. Measure pressure with gage attached to specific adaptor. Do not use universal adaptors.
- E. Disconnect test gas and connect proper gas to each system. Purge entire system to remove test gas. Check with analyzer suitable for gas installed.

**END OF SECTION 226005**

## **SECTION 230510 - GENERAL MECHANICAL HVAC**

### **PART 1 - GENERAL**

#### **1.1 WORK INCLUDED**

- A. The mechanical Work is governed by the entire specification and not just Division 21, 22, 23. The entire specification must be examined for requirements relating to the Work hereunder. The Work covered by this and all other Mechanical subsections consists of furnishing labor, equipment, and materials in accordance with the specifications or drawings, or both, together with any incidental items not shown or specified which can be reasonably inferred or taken as belonging to the Work and necessary in good practice to provide a complete system described or shown as intended.
- B. Project is a renovation that requires specific demolition and installation for phased project areas with the rest of the mechanical systems remaining active serving an occupied building.
  - 1. Shut downs of mechanical systems will generally occur in off hours and during light occupancy times. Coordinate shut down times to be a minimum time required.
  - 2. The work will require phasing particularly for the second floor areas. The extent of phasing is to be coordinated with other contractors and Owner. However, there may be equipment, piping, ductwork, sprinkler, and controls systems that will need to be removed and/or installed outside the phasing areas including shut downs and reactivation of main mechanical systems. Work required out of the phasing project areas will generally occur during unoccupied times. Coordinate with Project Architect and owner for access to these occupied and possibly secure areas.
  - 3. Construction documents for the renovation project do not show all required piping and ductwork offsets for a complete and operating systems. Existing systems may require new systems to be modified for installation. Construction documents show reported as-built piping and ductwork systems. Verify on site all existing conditions.
  - 4. Demolition of and Connection to Existing Material, Equipment, and Systems:
    - a. Mechanical drawings show reported as-built and contract document locations of underground piping taken from past project drawings. Contractor to determine actual existing locations of underground piping as needed without additional cost to the Owner. Contractor to utilize pipe location devices as needed. Contact ARCHITECT if actual piping locations are different than shown. Excavation shall be required to locate piping, remove piping, install piping, and connect to existing piping.
      - 1) Where select piping systems are shown to be partially removed for connection, prepare and protect the connection points appropriately to ensure later continuity of Work. CONTRACTOR shall provide all temporary supports as required and completely replace material and equipment that are not suitably protected during construction and becomes damaged.
      - 2) CONTRACTOR shall provide all temporary caps for ductwork, piping, pneumatic controls, as required. CONTRACTOR shall provide all temporary partitions such as air-tight air plenum separations as required to maintain continuity of systems and to not contaminate existing systems or finishes.

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CONTRACTOR shall remove all temporary provisions when the phase of Work is completed or earlier if required.

- 3) Where items are shown to be removed such as piping or ductwork it is to be assumed that this includes the removal of the respective system including but not limited to pipe and duct hangers, supports, conduit, wiring, valves, and other related trim and appurtenances. Piping to be removed through a floor assumes that the piping is to be capped below floor and the floor finished smooth.
  - 4) Mechanical Contractor shall be available during Demolition Work for coordination and assistance for related Work. Mechanical Contractor shall locate, isolate, and drain piping systems to be removed.
  - 5) Concrete wall and floor penetrations required. Saw cut or core drill as required. Sleeve penetrations as specified. Coordinate with Architect for structural beam penetration approvals.
  - 6) Demolition drawings do not show all work involved but rather a representation of the work expected. Demolition drawings are to be coordinated with the phase drawings for more information as to when work may be required.
5. Provide temporary air ventilation requirements as shown on the drawings and as required for occupied areas affected by construction.

### **C. WORDING OF THE SPECIFICATIONS**

1. These specifications are of the abbreviated or streamlined type and frequently include incomplete sentences. However, periods are used for clarity. Words such as "shall", "shall be", "the Contractor shall", and similar mandatory phrases shall be supplied by inference in the same manner as they are required for the notes on the drawings.

### **D. CODES AND REGULATIONS**

1. All Work hereunder shall be strictly in conformance with applicable codes and regulations. All plumbing Work shall be in accordance with the Codes listed below and City and Borough of Juneau modifications insofar as minimum requirements are concerned, but the drawings and specifications shall govern in case the minimum requirements are exceeded. All electrical equipment shall bear the UL label.
  - a. Title 19: City and Borough of Juneau, Building Regulation
  - b. International Building Code and Mechanical Code-2006 edition
  - c. Uniform Plumbing Code-2006 edition
  - d. International Fire Code-2006 edition
  - c. Uniform Fire Code (UFC)
  - d. Local Sewer and Water District Requirements
  - e. City and Borough of Juneau Department of Health
  - f. State Department of Health
  - g. Local Fire Marshall
  - h. Local Air Pollution Control Agency
  - i. State of Alaska Boiler and Unfired Pressure Vessel Inspection Law
  - j. Occupational Safety and Health Administration (OSHA)
  - k. National Fire Protection Association (NFPA)
  - l. National Electric Code (NEC)
  - m. Alaska State Fire Laws

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- n. Environmental Protection Agency (EPA)
- o. Sheet Metal and Air Conditioning Contractors Association (SMACNA)
- p. Pressure Vessels: ASME code stamp required on all pressure vessels and relief valves.

### **1.2 SUBMITTALS**

- A. General: Provide submittals according to Conditions of Contract, Division 1 Specifications Sections, and as required hereunder. Drawings and general provisions of the Contract, including General, Supplementary Conditions, and all Division 1 Specification Sections, apply to this Section. Approval of the data shall not eliminate responsibility for compliance with the Drawings or Specifications unless specific attention has been called in writing to proposed deviations at the time of transmittal of the data and such deviations have been approved, nor shall it eliminate the responsibility for freedom of errors of any sort in the data. All Mechanical submittal data for Project construction is to be turned in for approval at the same time in order for an efficient review process. Partial submittals may be rejected until the full submittal is received.
- B. Specified Products: Trade names and catalog numbers of manufactured products included herein are intended to indicate the type, size, and grade of quality of equipment and materials required and such equipment and materials are approved for installation, subject to full compliance with the Specifications. Except where single manufacture is specified for standardization, requests for approval of other manufacturers than those specified must be accompanied by complete descriptions including overall dimensions, performance data, and, if catalog material, identification of specific products or items proposed.
- C. Submittal Format: All data shall be submitted at one time in neatly bound loose-leaf three ring binders with pockets and tabulated in order of Specification Division 15000 section. All data shall be typed, minimum 10 point font, no exceptions. Data submitted that is not conforming to these specification requirements will be returned without reviewing and will need to be resubmitted at Contractors sole complete cost.
  - 1. Each binder shall have a set of separators with index tabs A to Z. Tabs are to be printed type. Slip-in tabs not acceptable.
  - 2. The first page shall be a cover sheet with project name, address, date, submittal product name, all applicable contractors and contact information, and all applicable consultants and contact information.
  - 3. Second page shall be a submittal manual index of all project Specification sections with respective tab numbers, and respective book number, if applicable.
  - 4. The first page of each manuals section shall be an index of that respective project Specification section and number with each product name, manufacturer name and model number.
  - 5. Each manuals section shall be labeled and certified by mechanical Subcontractor that the data presented is in accordance with project Specifications. Index sheet in front of completed binder listing each piece of equipment or material submitted.
  - 6. Product Data to be utilized shall be flagged and noted and all other data shall be crossed out or otherwise flagged that it is not in the project.
  - 7. Data shall be inserted in binders in order of Specification number. Specification number

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shall be clearly labeled on each submittal page.

8. As-built Drawings: As-built drawings shall be required from all Mechanical Subcontractors and shall accurately show all changes from Contract Documents for existing and new piping, ductwork, and equipment. As-built drawings shall be updated daily and available for inspection on-site by the ARCHITECT.
9. Operating and Maintenance Data: See Division 1 for the number of sets of data to be provided for submittal and additional requirements. Separate and complete manuals are required for the two volumes of mechanical work. Provide a minimum of four (4) copies. The following data shall be provided to the ARCHITECT for approval 30 days prior to the request for Substantial Completion inspection. Except for the valve directory and nameplate directory, the data shall be provided complete at one time. Partial or separate data will be returned for completion. The valve directory and nameplate directory may be provided for approval previous to the other data. The first section of the O&M manual shall be as listed in the following subparagraphs in order presented hereunder. All of the following subparagraphs sections shall be furnished with permanent plastic see through covers. See requirements under 1.4.C for additional submittal and formatting requirements.
  - a. Cover and Index sheets as in 1.4.C. above.
  - b. Description of systems and operating instructions: The Contractor shall prepare a brief type written description of all new and modified systems, explaining how the systems operate and indicating the proper settings of controls and switches. The instructions are to include all information required for the proper settings of controls and switches. The instructions are to include all information required for the proper operation of the systems. Technical knowledge on controls or adjustments requiring specialized technicians should not be included in the instructions.
  - c. Nameplate directory: List of all new air handlers, fans, water heaters, expansion tanks, thermostatic mixing valves, pumps, terminal heating units, and other equipment nameplates, giving manufacturer's nameplate data, nameplate designation, location of equipment, area served, switch location, and normal position of the switch. Motor data must include the horsepower, voltage, full load amperage, phase, etc. See Section 15075 - Mechanical Identification.
  - d. Manufacturers' literature: Manufacturers' instructions for operation and maintenance of all mechanical equipment and specialties, including replacement parts lists, capacity curves or charts, equipment data sheets, manufacturers' literature on the equipment, and as-built wiring diagrams and control drawings, all suitable for side binding to 8-1/2 x 11 inch size. All data not applicable to the job is to be crossed out or deleted. Manuals turned in for review with non-applicable data not crossed out shall be returned to the Contractor.
  - e. Maintenance instructions: Typewritten instructions for the maintenance of the systems, listing each service required on all of the mechanical equipment, including inspections, lubrication, cleaning, checking, and all other operations required. The list is to include all types of bearings installed on the equipment and the type of lubricant required.
  - f. Maintenance schedule: List of each item of mechanical equipment requiring inspection, lubrication, cleaning, or service including the type of bearings and type of lubricating means for each piece of equipment. Each item of equipment is to be listed separately with the service required. List to include the times during the year when such inspection and maintenance shall be performed. The specific maintenance

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required shall be referenced back to the maintenance instructions.

- g. Valve directory: Indicating valve number, size, location, function, and normal position for each numbered valve. The directory shall be provided and approved before installation of the valve tags. A sample arrangement will be furnished upon request. Two copies required for the preliminary list. See Section 15075 - Mechanical Identification.
- 10. Guide Documents: Sample operating and maintenance instructions and maintenance schedule may be obtained from the ARCHITECT upon request, to assist in properly setting up the data.
- 11. Instructions To Personnel: The mechanical Subcontractor shall instruct operating personnel in the operation and maintenance of the systems before accepting the responsibility of operation and maintenance of the systems.
- 12. Qualification Data: For sheet metal installers. For pipe fitters.
- 13. Shop Drawings: Verify on-site as-built conditions during demolition of construction if required where system is concealed. Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections. Shop drawings shall be coordinated and corrected with all other disciplines for interference and location of existing and new conditions prior to submittal to ARCHITECT.
- 14. Submit prior to Substantial Completion Inspection and Final Inspection a detailed list of equipment and systems that will NOT be completed for the completion date. Include status and information of deficiencies from all previous inspection reports.
- 15. Submit prior to Re-inspections of Substantial Completion Inspections, if applicable, and the Final Inspection a marked copy of the previous Engineers Inspection Reports detailing all items that have been completed and all items that have not been completed with reasons thereof. Re-inspection or Final Inspection will not occur until receipt of this list.

### **D. COOPERATIVE WORK**

- 1. The Work hereunder shall be coordinated between various mechanical sections including Division 13 and with the Work specified under other divisions or contracts toward rapid completion of the entire project. If any cooperative Work must be altered due to lack of proper supervision hereunder, or failure to make proper provisions in time, then the Work hereunder shall include all expense of such changes as are necessary to be made in the Work under other divisions and contracts, and such changes shall be directly supervised by the ARCHITECT and shall be made to the satisfaction of the ARCHITECT.
- 2. In general pitched piping and ductwork shall take preference in location within the project area. Coordination of all drain valves, duct access doors, and other equipment requiring access and maintenance procedures is required with all building components during construction for maximum accessibility and proper location as intended.
- 3. Existing systems: Where modifications are to be made to existing systems which are required to remain in service for areas of the building not affected by this Project, CONTRACTOR shall coordinate disruption with Using Agency. WORK shall be performed only upon specific Approval, time, and duration as agreed to by the ARCHITECT.

### **E. QUALITY ASSURANCE**

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1. Perform Work in conformance with all applicable codes, regulations, local ordinances, contract documents, and generally accepted good practice. If discrepancies exist between specifications and contract plans then the solution that provides the Owner with the highest quality of product or installation shall be deemed as intended by the contract documents.
2. All sheet metal workers shall have a minimum documented sheet metal fabrication and installation experience in commercial and industrial facilities of 3 years or be enrolled in an Alaska Department of Labor approved Sheet Metal Apprentice program. The ratio of on-site workers shall not exceed 3 apprentices or sheet metal workers for every one foreman. A foreman is defined as a sheet metal worker with minimum 3 years experience as detailed above or is an approved Journeyman.
3. All Plumbers and Pipe Fitters shall have a minimum documented installation experience in commercial or industrial facilities of 3 years or be enrolled in an Alaska Department of Labor approved Plumbers and Pipe Fitters Apprentice program. The ratio of on-site workers shall not exceed 2 apprentices or pipe fitters for every one Journeyman.

### **F. FIELD MEASUREMENTS**

1. See Division 1 for specific requirements regarding: Field Measurements and Site Conditions.
2. Verifications: All measurements shall be verified at the site and prior to fabrications of equipment and systems. The existing conditions shall be fully observed before beginning the Work hereunder, and the Work hereunder executed in full coordination with the existing conditions observed. All hazardous material including asbestos materials that are discovered during the course of construction shall be immediately brought to the attention of the ARCHITECT for action. All Work performed with hazardous materials not approved by the Owner shall be at the full responsibility of the contractor and not the Owner.
3. Changes: Variations apparently necessary due to existing conditions shall be made only on approval in writing by the ARCHITECT.

### **G. TRANSPORTATION TO SITE AND ON-SITE STORAGE**

1. Protection: Materials and equipment which are intended to be installed and operated inside completed building envelope shall be protected. It is CONTRACTOR'S responsibility to deliver all material and equipment to ARCHITECT at completion of WORK in an "as new condition." "As new condition" shall mean free of corrosion, dirt, rust, stain, or physical damage resulting from or during transportation to site, temporary storage at site, and construction period. CONTRACTOR must address potential damage to material and equipment caused by exposure to elements including wind, rain, and construction process. CONTRACTOR shall take all precautions to protect material and equipment. Precautions shall include, but not be limited to, protection from moisture to ensure materials and equipment remain dry, and equipment is reasonably free of debris. Material and equipment which have been exposed to moisture are subject to timely replacement by CONTRACTOR at no additional cost to OWNER.

### **H. NAMEPLATES:**

1. Information: Provide major components of equipment with Manufacturer's name, address, catalog number, and capacity indicated on a nameplate, securely affixed in a conspicuous

## **SECTION 230510 - GENERAL MECHANICAL HVAC**

place on component.

### **I. WARRANTY**

1. See Division 1 for specific requirements regarding: Product warranties and product bonds.
2. The contractor shall provide continuous and generally trouble-free operation of the mechanical systems for the time period listed in Division 1 or for one year after final completion of entire project whichever time period is longer. The operation and maintenance of systems other than incidental operations such as room thermostat settings or changing of air filters, shall be the sole responsibility of the contractor and shall be addressed by the contractor immediately if deficiencies are present. Leaking of valves, flanges, or air vents shall be addressed immediately by the contractor during the warranty period. Control settings, noise problems, and other deficiencies resulting in unsatisfactory environmental conditions shall be addressed immediately.

### **PART 2 - PRODUCTS (NOT USED)**

### **PART 3 - EXECUTION (NOT USED)**

**END OF SECTION 230510**



## **SECTION 230519 - METERS AND GAGES FOR HVAC PIPING**

### **PART 1 - GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Pressure gages and pressure gage taps.
- B. Thermometers and thermometer wells.

#### **1.2 RELATED REQUIREMENTS**

- A. Section 232113 - Hydronic Piping.
- B. Section 230923 - Direct-Digital Control System for HVAC.
- C. Section 230993 - Sequence of Operations for HVAC Controls.
- D. Drawings and General provisions of the Contract, including General, Supplementary Conditions, and all Division Specifications Section, apply to this section.

#### **1.3 REFERENCE STANDARDS**

- A. ASME B40.100 - Pressure Gauges and Gauge Attachments; The American Society of Mechanical Engineers; 2005.
- B. ASTM E 1 - Standard Specification for ASTM Thermometers; 2007.
- C. ASTM E 77 - Standard Test Method for Inspection and Verification of Thermometers; 2007.
- D. UL 393 - Indicating Pressure Gauges for Fire-Protection Service; Underwriters Laboratories Inc.; 2005.
- E. UL 404 - Gages, Indicating Pressure, for Compressed Gas Service; Underwriters Laboratories Inc.; 2005.

#### **1.4 SUBMITTALS**

- A. See Section 013300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide list that indicates use, operating range, total range and location for manufactured components.
- C. Project Record Documents: Record actual locations of components and instrumentation.
- D. Operation and Maintenance Data

## **SECTION 230519 - METERS AND GAGES FOR HVAC PIPING**

E. Maintenance Materials: Furnish the following for City and Borough of Juneau's use in maintenance of project.

1. See Section 016000 - Product Requirements. for additional provisions.
2. Extra Pressure Gages: One of each type and size.

### **1.5 FIELD CONDITIONS**

A. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports and test plugs.

## **PART 2 - PRODUCTS**

### **2.1 PRESSURE GAGES**

A. Manufacturers:

1. Dwyer Instruments, Inc: [www.dwyer-inst.com](http://www.dwyer-inst.com).
2. Moeller Instrument Co., Inc: [www.moellerinstrument.com](http://www.moellerinstrument.com).
3. Omega Engineering, Inc: [www.omega.com](http://www.omega.com).

B. Pressure Gages: ASME B40.100, UL 393 drawn steel case, phosphor bronze bourdon tube, rotary brass movement, brass socket, with front recalibration adjustment, black scale on white background.

1. Case: Steel with brass bourdon tube.
2. Size: 4-1/2 inch diameter.
3. Mid-Scale Accuracy: One percent.
4. Scale: Psi and KPa.

### **2.2 PRESSURE GAGE TAPPINGS**

A. Gage Cock: Tee or lever handle, brass for maximum 150 psi.

### **2.3 STEM TYPE THERMOMETERS**

A. Manufacturers:

1. Dwyer Instruments, Inc: [www.dwyer-inst.com](http://www.dwyer-inst.com).
2. Omega Engineering, Inc: [www.omega.com](http://www.omega.com).
3. Weksler Glass Thermometer Corp: [www.wekslerglass.com](http://www.wekslerglass.com).

B. Thermometers - Fixed Mounting: Red- or blue-appearing non-toxic liquid in glass; ASTM E 1; lens front tube, cast aluminum case with enamel finish.

1. Size: 9 inch scale.

## SECTION 230519 - METERS AND GAGES FOR HVAC PIPING

2. Window: Clear Lexan.
  3. Stem: 3/4 inch brass.
  4. Accuracy: 2 percent, per ASTM E 77.
  5. Calibration: Degrees F.
- C. Thermometers - Adjustable Angle: Red- or blue-appearing non-toxic liquid in glass; ASTM E 1; lens front tube, cast aluminum case with enamel finish, cast aluminum adjustable joint with positive locking device; adjustable 360 degrees in horizontal plane, 180 degrees in vertical plane.
1. Size: 9 inch scale.
  2. Window: Clear Lexan.
  3. Stem: 3/4 inch NPT brass.
  4. Accuracy: 2 percent, per ASTM E 77.
  5. Calibration: Degrees F.

### 2.4 DIAL THERMOMETERS

- A. Manufacturers:
1. Dwyer Instruments, Inc: [www.dwyer-inst.com](http://www.dwyer-inst.com).
  2. Omega Engineering, Inc: [www.omega.com](http://www.omega.com).
  3. Weksler Glass Thermometer Corp: [www.wekslerglass.com](http://www.wekslerglass.com).
- B. Thermometers - Fixed Mounting: Dial type bimetallic actuated; ASTM E 1; stainless steel case, silicone fluid damping, white with black markings and black pointer, hermetically sealed lens, stainless steel stem.
1. Size: 5 inch diameter dial.
  2. Lens: Clear glass.
  3. Accuracy: 1 percent.
  4. Calibration: Degrees F.
- C. Thermometer: ASTM E 1, stainless steel case, adjustable angle with front recalibration, bimetallic helix actuated with silicone fluid damping, white with black markings and black pointer hermetically sealed lens, stainless steel stem.
1. Size: 3 inch diameter dial.
  2. Lens: Clear glass.
  3. Accuracy: 1 percent.
  4. Calibration: Degrees F.

### 2.5 THERMOMETER SUPPORTS

- A. Socket: Brass separable sockets for thermometer stems with or without extensions as required, and with cap and chain.

## **SECTION 230519 - METERS AND GAGES FOR HVAC PIPING**

### **2.6 TEST PLUGS**

- A. Test Plug: 1/4 inch or 1/2 inch brass fitting and cap for receiving 1/8 inch outside diameter pressure or temperature probe with neoprene core for temperatures up to 200 degrees F.
- B. Test Plug: 1/4 inch or 1/2 inch brass fitting and cap for receiving 1/8 inch outside diameter pressure or temperature probe with Nordel core for temperatures up to 350 degrees F.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Provide one pressure gage per pump, installing taps before strainers and on suction and discharge of pump. Pipe to gage.
- C. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inch for installation of thermometer sockets. Ensure sockets allow clearance from insulation.
- D. Install thermometers in air duct systems on flanges.
- E. Install thermometer sockets adjacent to controls systems thermostat, transmitter, or sensor sockets. Where thermometers are provided on local panels, duct or pipe mounted thermometers are provided on local panels, duct or pipe mounted thermometers are not required.
- F. Locate duct mounted thermometers minimum 10 feet downstream of mixing dampers, coils, or other devices causing air turbulence.
- G. Coil and conceal excess capillary on remote element instruments.
- H. Provide instruments with scale ranges selected according to service with largest appropriate scale.
- I. Install gages and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.
- J. Adjust gages and thermometers to final angle, clean windows and lenses, and calibrate to zero.
- K. Locate test plugs adjacent thermometers and thermometer sockets.

**END OF SECTION 230519**

## **SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT**

### **PART 1 - GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Nameplates.
- B. Tags.
- C. Pipe Markers.

#### **1.2 RELATED REQUIREMENTS**

- A. Section 099123- Painting and Coating: Identification painting.
- B. Drawings and General provisions of the Contract, including General, Supplementary Conditions, and all Division Specifications Section, apply to this section.

#### **1.3 REFERENCE STANDARDS**

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; The American Society of Mechanical Engineers; 2007.
- B. ASTM D 709 - Standard Specification for Laminated Thermosetting Materials; 2001 (Reapproved 2007).

#### **1.4 SUBMITTALS**

- A. See Section 013300 - Administrative Requirements, for submittal procedures.
- B. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
- C. Product Data: Provide manufacturers catalog literature for each product required.
- D. Manufacturer's Installation Instructions: Indicate special procedures, and installation.
- E. Project Record Documents: Record actual locations of tagged valves.

## **SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT**

### **PART 2 - PRODUCTS**

#### **2.1 IDENTIFICATION APPLICATIONS**

- A. Air Handling Units: Nameplates.
- B. Automatic Controls: Tags. Key to control schematic.
- C. Control Panels: Nameplates.
- D. Dampers: Ceiling tacks, where located above lay-in ceiling.
- E. Pumps: Nameplates.
- F. Small-sized Equipment: Tags.
- G. Tanks: Nameplates.
- H. Valves: Tags and ceiling tacks where located above lay-in ceiling.

#### **2.2 NAMEPLATES**

- A. Manufacturers:
  - 1. Advanced Graphic Engraving: [www.advancedgraphicengraving.com](http://www.advancedgraphicengraving.com).
  - 2. Kolbi Pipe Marker Co.: [www.kolbipipemarkers.com](http://www.kolbipipemarkers.com).
  - 3. Seton Identification Products: [www.seton.com](http://www.seton.com).
  - 4. Substitutions: See Section 01 6000 - Product Requirements.
  - 5. Letter Color: White.
  - 6. Letter Height: 1/4 inch.
  - 7. Background Color: Black.
  - 8. Plastic: Conform to ASTM D 709.

#### **2.3 TAGS**

- A. Manufacturers:
  - 1. Advanced Graphic Engraving: [www.advancedgraphicengraving.com](http://www.advancedgraphicengraving.com).
  - 2. Brady Corporation: [www.bradycorp.com](http://www.bradycorp.com).
  - 3. Kolbi Pipe Marker Co.: [www.kolbipipemarkers.com](http://www.kolbipipemarkers.com).
  - 4. Seton Identification Products: [www.seton.com](http://www.seton.com).
  - 5. Substitutions: See Section 016000 - Product Requirements.
- B. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.
- C. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth

## **SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT**

edges.

### **2.4 PIPE MARKERS**

#### **A. Manufacturers:**

1. Brady Corporation: [www.bradycorp.com](http://www.bradycorp.com).
2. Kolbi Pipe Marker Co.: [www.kolbipipemarkers.com](http://www.kolbipipemarkers.com).
3. MIFAB, Inc.: [www.mifab.com](http://www.mifab.com).
4. Seton Identification Products: [www.seton.com](http://www.seton.com).
5. Substitutions: See Section 016000 - Product Requirements.

#### **B. Plastic Pipe Markers:** Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

#### **C. Plastic Tape Pipe Markers:** Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

### **2.5 CEILING TACKS**

#### **A. Description:** Steel with 3/4 inch diameter color coded head.

#### **B. Color code as follows:**

1. HVAC Equipment: Yellow.
2. Fire Dampers and Smoke Dampers: Red.
3. Heating/Cooling Valves: Blue.

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

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

### **3.2 INSTALLATION**

#### **A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.**

#### **B. Install tags with corrosion resistant chain.**

#### **C. Install plastic pipe markers in accordance with manufacturer's instructions.**

#### **D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.**

## **SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT**

- E. Use tags on piping 3/4 inch diameter and smaller.
  - 1. Identify service, flow direction, and pressure.
  - 2. Install in clear view and align with axis of piping.
  - 3. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.
- F. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

**END OF SECTION 230553**



## **SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC**

### **PART 1 - GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Testing, adjustment, and balancing of air systems. Testing, adjustment, and balancing of hydronic systems. Measurement of final operating condition of HVAC systems.
- B. Specific Scope of Work is shown on contract documents including but not limited to:
  - 1. HVAC-1 including chilled water pump.
  - 2. All constant volume terminal boxes.
  - 3. All exhaust fans.
  - 4. All heating units including finned pipe convectors and radiant ceiling panels.
  - 5. Existing central fan system ASU-1 ventilation zones.
  - 6. Final measurements of existing central fan systems ASU-1 and EF-1.

#### **1.2 REFERENCE STANDARDS**

- A. AABC MN-1 - AABC National Standards for Total System Balance; Associated Air Balance Council; 2002.
- B. ASHRAE Std 111 - Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.; 1988, with 1997 Errata.
- C. NEBB (TAB) - Procedural Standards for Testing Adjusting Balancing of Environmental Systems; National Environmental Balancing Bureau; 2005, Seventh Edition.
- D. SMACNA (TAB) - HVAC Systems Testing, Adjusting, and Balancing; Sheet Metal and Air Conditioning Contractors' National Association; 2002.

#### **1.3 SUBMITTALS**

- A. See Section 013300 - Administrative Requirements, for submittal procedures.
- B. Qualifications: Submit name of adjusting and balancing agency and TAB supervisor for approval within 30 days after award of Contract.
- C. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
  - 1. Submit to Murray & Associates PC-Mechanical Engineers.
  - 2. Submit six weeks prior to starting the testing, adjusting, and balancing work.
  - 3. Include certification that the plan developer has reviewed the contract documents, the equipment and systems, and the control system with the Murray & Associates PC-

## **SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC**

Mechanical Engineers and other installers to sufficiently understand the design intent for each system.

4. Include at least the following in the plan:
  - a. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
  - b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
  - c. Identification and types of measurement instruments to be used and their most recent calibration date.
  - d. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
  - e. Final test report forms to be used.
  - f. Detailed step-by-step procedures for TAB work for each system and issue, including:
    - 1) Terminal flow calibration (for each terminal type).
    - 2) Diffuser proportioning.
    - 3) Branch/submain proportioning.
    - 4) Total flow calculations.
    - 5) Rechecking.
    - 6) Diversity issues.
  - g. Criteria for using air flow straighteners or relocating flow stations and sensors; analogous explanations for the water side.
  - h. Details of how TOTAL flow will be determined; for example:
    - 1) Air: Sum of terminal flows via control system calibrated readings or via hood readings of all terminals, supply (SA) and return air (RA) pitot traverse, SA or RA flow stations.
    - 2) Water: Pump curves, circuit setter, flow station, ultrasonic, etc.
  - i. Confirmation of understanding of the outside air ventilation criteria under all conditions.
  - j. Method of verifying and setting minimum outside air flow rate will be verified and set and for what level (total building, zone, etc.).
  - k. Method of checking building static and exhaust fan and/or relief damper capacity.
  - l. Proposed selection points for sound measurements methods.
  - m. Time schedule for TAB work to be done in phases (by floor, etc.).
  - n. False loading of systems to complete TAB work, if specified.
  - o. Exhaust fan balancing and capacity verifications, including any required room pressure differentials.
  - p. Procedures for formal deficiency reports, including scope, frequency and distribution.
- D. Field Logs: Submit at least twice a week to Commissioning Authority.
- E. Control System Coordination Reports: Communicate in writing to the controls installer all setpoint and parameter changes made or problems and discrepancies identified during TAB that affect, or could affect, the control system setup and operation.

## **SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC**

- F. Progress Reports.
- G. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
  - 1. Revise TAB plan to reflect actual procedures and submit as part of final report.
  - 2. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Murray & Associates PC-Mechanical Engineers and for inclusion in operating and maintenance manuals.
  - 3. Provide reports in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.
  - 4. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
  - 5. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
  - 6. Units of Measure: Report data in both I-P (inch-pound) and SI (metric) units.
  - 7. Include the following on the title page of each report:
    - a. Name of Testing, Adjusting, and Balancing Agency.
    - b. Address of Testing, Adjusting, and Balancing Agency.
    - c. Telephone number of Testing, Adjusting, and Balancing Agency.
    - d. Project name.
    - e. Project location.
    - f. Project Murray & Associates PC-Mechanical Engineers.
    - g. Project Engineer.
    - h. Project.
    - i. Project altitude.
    - j. Report date.
- H. Project Record Documents: Record actual locations of flow measuring stations and balancing valves and rough setting.

## **PART 2 - PRODUCTS - NOT USED**

## **PART 3 - EXECUTION**

### **3.1 GENERAL REQUIREMENTS**

- A. Perform total system balance in accordance with one of the following:
  - 1. AABC MN-1, AABC National Standards for Total System Balance.
  - 2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
  - 3. NEBB Procedural Standards for Testing Adjusting Balancing of Environmental Systems.
  - 4. SMACNA HVAC Systems Testing, Adjusting, and Balancing.

## **SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC**

5. Maintain at least one copy of the standard to be used at project site at all times.
- B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.
- C. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.
- D. TAB Agency Qualifications:
  1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
  2. Having minimum of three years documented experience.
  3. Certified by one of the following:
    - a. AABC, Associated Air Balance Council: [www.aabchq.com](http://www.aabchq.com); upon completion submit AABC National Performance Guaranty.
    - b. NEBB, National Environmental Balancing Bureau: [www.nebb.org](http://www.nebb.org).
    - c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: [www.tabbcertified.org](http://www.tabbcertified.org).
- E. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

### **3.2 EXAMINATION**

- A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
  1. Systems are started and operating in a safe and normal condition.
  2. Temperature control systems are installed complete and operable.
  3. Proper thermal overload protection is in place for electrical equipment.
  4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
  5. Duct systems are clean of debris.
  6. Fans are rotating correctly.
  7. Air coil fins are cleaned and combed.
  8. Access doors are closed and duct end caps are in place.
  9. Air outlets are installed and connected.
  10. Duct system leakage is minimized.
  11. Pumps are rotating correctly.
  12. Proper strainer baskets are clean and in place.
  13. Service and balance valves are open.
- B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.
- C. Beginning of work means acceptance of existing conditions.

## **SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC**

### **3.3 PREPARATION**

- A. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Murray & Associates PC-Mechanical Engineers to facilitate spot checks during testing.
- B. Provide additional balancing devices as required.

### **3.4 ADJUSTMENT TOLERANCES**

- A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.
- B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

### **3.5 RECORDING AND ADJUSTING**

- A. Field Logs: Maintain written logs including:
  - 1. Running log of events and issues.
  - 2. Discrepancies, deficient or uncompleted work by others.
  - 3. Contract interpretation requests.
  - 4. Lists of completed tests.
- B. Ensure recorded data represents actual measured or observed conditions.
- C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- D. Mark on the drawings the locations where traverse and other critical measurements were taken and cross reference the location in the final report.
- E. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- F. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
- G. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the City and Borough of Juneau.
- H. Check and adjust systems approximately six months after final acceptance and submit report.

### **3.6 AIR SYSTEM PROCEDURE**

- A. Adjust air handling and distribution systems to provide required or design supply, return, and

## **SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC**

exhaust air quantities.

- B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.
- C. Measure air quantities at air inlets and outlets.
- D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.
- E. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.
- F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.
- G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.
- H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.
- I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.
- J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.
- K. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches positive static pressure near the building entries.

### **3.7 WATER SYSTEM PROCEDURE**

- A. Adjust water systems to provide required or design quantities.
- B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gauges to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.
- C. Adjust systems to provide specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.
- D. Effect system balance with automatic control valves fully open to heat transfer elements.
- E. Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.

## **SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC**

- F. Where available pump capacity is less than total flow requirements or individual system parts, full flow in one part may be simulated by temporary restriction of flow to other parts.

### **3.8 MINIMUM DATA TO BE REPORTED**

**A. Electric Motors:**

1. Manufacturer
2. Model/Frame
3. HP/BHP
4. Phase, voltage, amperage; nameplate, actual, no load
5. RPM
6. Service factor
7. Starter size, rating, heater elements
8. Sheave Make/Size/Bore

**B. V-Belt Drives:**

1. Identification/location
2. Required driven RPM
3. Driven sheave, diameter and RPM
4. Belt, size and quantity
5. Motor sheave diameter and RPM
6. Center to center distance, maximum, minimum, and actual

**C. Pumps:**

1. Identification/number
2. Manufacturer
3. Size/model
4. Impeller
5. Service
6. Design flow rate, pressure drop, BHP
7. Actual flow rate, pressure drop, BHP
8. Discharge pressure
9. Suction pressure
10. Total operating head pressure

**D. Air Moving Equipment:**

1. Location
2. Manufacturer
3. Model number
4. Serial number
5. Arrangement/Class/Discharge
6. Air flow, specified and actual
7. Return air flow, specified and actual
8. Outside air flow, specified and actual
9. Total static pressure (total external), specified and actual

## **SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC**

10. Inlet pressure
11. Discharge pressure
12. Sheave Make/Size/Bore
13. Number of Belts/Make/Size
14. Fan RPM

### **E. Return Air/Outside Air:**

1. Identification/location
2. Design air flow
3. Actual air flow
4. Design return air flow
5. Actual return air flow
6. Design outside air flow
7. Actual outside air flow
8. Return air temperature
9. Outside air temperature
10. Required mixed air temperature
11. Actual mixed air temperature
12. Design outside/return air ratio
13. Actual outside/return air ratio

### **F. Exhaust Fans:**

1. Location
2. Manufacturer
3. Model number
4. Serial number
5. Air flow, specified and actual
6. Total static pressure (total external), specified and actual
7. Inlet pressure
8. Discharge pressure
9. Sheave Make/Size/Bore
10. Number of Belts/Make/Size
11. Fan RPM

### **G. Duct Traverses:**

1. System zone/branch
2. Duct size
3. Area
4. Design velocity
5. Design air flow
6. Test velocity
7. Test air flow
8. Duct static pressure
9. Air temperature
10. Air correction factor



## **SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC**

### **H. Terminal Unit Data:**

1. Manufacturer
2. Type, constant, variable, single, dual duct
3. Identification/number
4. Location
5. Model number
6. Size
7. Minimum static pressure
8. Minimum design air flow
9. Maximum design air flow
10. Maximum actual air flow
11. Inlet static pressure

**END OF SECTION 230593**

## **SECTION 230713 - DUCT INSULATION**

### **PART 1 - GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Duct insulation.
- B. Duct Liner.

#### **1.2 RELATED REQUIREMENTS**

- A. Section 220553 - Identification for Plumbing Piping and Equipment.
- B. Section 230553 - Identification for HVAC Piping and Equipment.
- C. Section 233100 - HVAC Ducts and Casings: Glass fiber ducts.
- D. Drawings and General provisions of the Contract, including General, Supplementary Conditions, and all Division Specifications Section, apply to this section.

#### **1.3 REFERENCE STANDARDS**

- A. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2007.
- B. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2004.
- C. ASTM C 553 - Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2002.
- D. ASTM C 612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2004.
- E. ASTM C 1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material); 2005.
- F. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2008.
- G. ASTM E 96/E 96M - Standard Test Methods for Water Vapor Transmission of Materials; 2005.
- H. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2006.
- I. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association; 2005.

## **SECTION 230713 - DUCT INSULATION**

- J. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Underwriters Laboratories Inc.; 2008.

### **1.4 SUBMITTALS**

- A. See Section 013300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.
- C. Manufacturer's Instructions: Indicate installation procedures necessary to ensure acceptable workmanship and that installation standards will be achieved.

### **1.5 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than three years of documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified in this section, with minimum 3 years of experience and approved by manufacturer.

### **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.
- B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

### **1.7 FIELD CONDITIONS**

- A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.
- B. Maintain temperature during and after installation for minimum period of 24 hours.

## **PART 2 - PRODUCTS**

### **2.1 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION**

- A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E 84, NFPA 255, or UL 723.

### **2.2 GLASS FIBER, FLEXIBLE**

## SECTION 230713 - DUCT INSULATION

### A. Manufacturer:

1. Knauf Insulation: [www.knaufusa.com](http://www.knaufusa.com).
2. Johns Manville Corporation: [www.jm.com](http://www.jm.com).
3. Owens Corning Corp: [www.owenscorning.com](http://www.owenscorning.com).
4. CertainTeed Corporation: [www.certainteed.com](http://www.certainteed.com).
5. Substitutions: See Section 01 6000 - Product Requirements.

### B. Insulation: ASTM C 553; flexible, noncombustible blanket.

1. 'K' value: 0.36 at 75 degrees F, when tested in accordance with ASTM C 518.
2. Maximum Service Temperature: 450 degrees F.
3. Maximum Water Vapor Sorption: 5.0 percent by weight.

### C. Vapor Barrier Jacket:

1. Kraft paper with glass fiber yarn and bonded to aluminized film.
2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E 96/E 96M.
3. Secure with pressure sensitive tape.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify that ducts have been tested before applying insulation materials.
- B. Verify that surfaces are clean, foreign material removed, and dry.

### 3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions. Install in accordance with NAIMA National Insulation Standards.
- B. Insulated ducts conveying air above ambient temperature:
  1. Provide with or without standard vapor barrier jacket.
  2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.

### 3.3 SCHEDULES

- A. Ductwork:
  1. Ducts Connected to exhaust and intake caps: Flexible Mineral Fiber Insulation: 1-1/2 inches thick.
  2. Supply air ductwork: Mineral Fiber Blanket Insulation 1-1/2 inches thick. .

**END OF SECTION 230713**

## **SECTION 230719 - HVAC PIPING INSULATION**

### **PART 1 - GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Piping insulation.

#### **1.2 RELATED REQUIREMENTS**

- A. Section 078413 – Penetration Firestopping.
- B. Section 221005 - Plumbing Piping: Placement of hangers and hanger inserts.
- C. Section 232113 - Hydronic Piping: Placement of hangers and hanger inserts.
- D. Drawings and General provisions of the Contract, including General, Supplementary Conditions, and all Division Specifications Section, apply to this section.

#### **1.3 REFERENCE STANDARDS**

- A. ASTM A 666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2003.
- B. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2007.
- C. ASTM C 177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded Hot Plate Apparatus; 2004.
- D. ASTM C 195 - Standard Specification for Mineral Fiber Thermal Insulating Cement; 2007.
- E. ASTM C 534/C 534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2008.
- F. ASTM C 547 - Standard Specification for Mineral Fiber Pipe Insulation; 2007.
- G. ASTM C 795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008.
- H. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2008.
- I. ASTM E 96/E 96M - Standard Test Methods for Water Vapor Transmission of Materials; 2005.
- J. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2006.
- K. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials;

## **SECTION 230719 - HVAC PIPING INSULATION**

Underwriters Laboratories Inc.; 2008.

### **1.4 SUBMITTALS**

- A. See Section 013300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.
- C. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

### **1.5 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum 3 years of experience.

### **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

### **1.7 FIELD CONDITIONS**

- A. Maintain ambient conditions required by manufacturers of each product.
- B. Maintain temperature before, during, and after installation for minimum of 24 hours.

## **PART 2 - PRODUCTS**

### **2.1 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION**

- A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E 84, NFPA 255, or UL 723.

### **2.2 GLASS FIBER**

- A. Manufacturers:
  - 1. ein insulation.com, Inc.: [www.eninsulation.com](http://www.eninsulation.com)
  - 2. Knauf Insulation: [www.knaufusa.com](http://www.knaufusa.com).
  - 3. Johns Manville Corporation: [www.jm.com](http://www.jm.com).

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4. Owens Corning Corp: [www.owenscorning.com](http://www.owenscorning.com).
  5. CertainTeed Corporation, [www.certainteed.com](http://www.certainteed.com).
- B. Insulation: ASTM C 547 and ASTM C 795; rigid molded, noncombustible.
1. 'K' value: ASTM C 177, 0.24 at 75 degrees F.
  2. Maximum service temperature: 850 degrees F.
  3. Maximum moisture absorption: 0.2 percent by volume.
- C. Insulation: ASTM C 547 and ASTM C 795; semi-rigid, noncombustible, end grain adhered to jacket.
1. 'K' value: ASTM C 177, 0.24 at 75 degrees F.
  2. Maximum service temperature: 650 degrees F.
  3. Maximum moisture absorption: 0.2 percent by volume.
- D. Vapor Barrier Jacket: White kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E 96/E 96M of 0.02 perm-inches.

### 2.3 JACKETS

- A. PVC Plastic.
1. Manufacturers:
    - a. Johns Manville Corporation: [www.jm.com](http://www.jm.com).
  2. Jacket: One piece molded type fitting covers and sheet material, off-white color.
    - a. Minimum Service Temperature: 0 degrees F.
    - b. Maximum Service Temperature: 150 degrees F.
    - c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E 96/E 96M.
    - d. Thickness: 10 mil.
    - e. Connections: Brush on welding adhesive.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify that piping has been tested before applying insulation materials.
- B. Verify that surfaces are clean and dry, with foreign material removed.

### 3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

## SECTION 230719 - HVAC PIPING INSULATION

- B. Install in accordance with NAIMA National Insulation Standards.
- C. Exposed Piping: Locate insulation and cover seams in least visible locations.
- D. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
- E. Glass fiber insulated pipes conveying fluids below ambient temperature:
  - 1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
  - 2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.
- F. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.
- G. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.
- H. Glass fiber insulated pipes conveying fluids above ambient temperature:
  - 1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
  - 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
- I. Inserts and Shields:
  - 1. Application: Piping 1-1/2 inches diameter or larger.
  - 2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
  - 3. Insert location: Between support shield and piping and under the finish jacket.
  - 4. Insert configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
  - 5. Insert material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.
- J. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 07 8400.
- K. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with PVC jacket and fitting covers.

### 3.3 SCHEDULES

- A. Piping Systems:
  - 1. Domestic Hot and Cold Water Supply and Hot Water recirculation: Mineral fiber pipe insulation, 1 inch thick. 1/2-inch thick may be used on plumbing piping branches 3/4-inch



## **SECTION 230719 - HVAC PIPING INSULATION**

- and smaller diameter when located inside walls.
2. Rain Leaders (Including Overflow Rain Leaders): Mineral fiber pipe insulation, 1 inch thick. Insulate entire length.
  3. Plumbing Vents Within 10 feet of the Vent Through Roof: Mineral fiber pipe insulation, 1 inch thick.
  4. Heating Water Supply and Return: Mineral fiber pipe insulation:
    - a. Pipe Size Range: Up to and including 1-1/2" pipe diameter; thickness of 1 inch.
    - b. Pipe Size Range: 2" to 2-1/2" pipe diameter, thickness of 1-1/2 inch.
  5. Roof Drain Bodies: Mineral Fiber Blanket Insulation 1-1/2 inches thick.

**END OF SECTION 230719**

## **SECTION 230923 - DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC**

### **PART 1 - GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Control equipment.

#### **1.2 RELATED REQUIREMENTS**

- A. Section 230913 - Instrumentation and Control Devices for HVAC.
- B. Section 230993 - Sequence of Operations for HVAC Controls.
- C. Section 262726 – Wiring Devices: Electrical characteristics and wiring connections.
- D. Drawings and General provisions of the Contract, including General, Supplementary Conditions, and all Division Specifications Section, apply to this section.

#### **1.3 REFERENCE STANDARDS**

- A. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

#### **1.4 SYSTEM DESCRIPTION**

- A. Furnish all labor, materials, equipment, and service necessary for a complete and operating HVAC control system for the Bartlett Regional Hospital Medical Surgical East Wing Renovation areas Direct Digital Control (DDC) Building Automation System (BAS). This project involves the installation and extension of an existing SEIBE direct digital control (DDC) system for the remodeled areas of the Bartlett Regional Hospital HVAC systems. The system will be networked to the existing Bartlett Regional Hospital Maintenance Department Host computer using telephone modem communication and Ethernet connections. This specification describes the primary products and performance of the digital control system. Associated sequence of operation descriptions and schematic control diagrams detail the scope of work for this project. The direct digital control equipment for this project shall be comprised of SIEBE (Barber-Colman) Network 8000 controllers and associated devices. The Owners existing "Signal" graphical software will be used for the additional graphic screens associated with this project.
- B. Controls for constant air volume terminals, radiation, reheat coils, fan coils, and the like when directly connected to the control units.
- C. Provide control systems consisting of thermostats, control valves, dampers and operators, indicating devices, interface equipment and other apparatus and accessories required to operate mechanical systems, and to perform functions specified.

## **SECTION 230923 - DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC**

- D. Include installation and calibration, supervision, adjustments, and fine tuning necessary for complete and fully operational system.

### **1.5 SUBMITTALS**

- A. See Section 013300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data for each system component and software module.
- C. Shop Drawings:
  - 1. Indicate trunk cable schematic showing programmable control unit locations, and trunk data conductors.
  - 2. List connected data points, including connected control unit and input device.
  - 3. Indicate system graphics indicating monitored systems, data (connected and calculated) point addresses, and operator notations. Provide demonstration diskette containing graphics.
  - 4. Show system configuration with peripheral devices, batteries, power supplies, diagrams, modems, and interconnections.
  - 5. Indicate description and sequence of operation of operating, user, and application software.
- D. Manufacturer's Instructions: Indicate manufacturer's installation instructions for all manufactured components.
- E. Project Record Documents: Record actual locations of control components, including control units, thermostats, and sensors.
  - 1. Revise shop drawings to reflect actual installation and operating sequences.
  - 2. Include submittals data in final "Record Documents" form.
- F. Operation and Maintenance Data:
  - 1. Operation and maintenance manuals shall be submitted for review and approval before the Final Inspection and OWNER training.
  - 2. The operation and maintenance manuals shall include the following information:
    - a. Include interconnection wiring diagrams complete field installed systems with identified and numbered, system components and devices.
    - b. A user's guide to operate the building management system. The guide shall include the following: logs on procedure; viewing system information; viewing and acknowledging alarms; changing set points; printing a trend or report; overriding a point. Include keyboard illustrations and step-by-step procedures indexed for each operator function.
    - c. Manufacturers data for all control components and maintenance information for all control components requiring period maintenance. Include inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.
    - d. Complete system "As-Built" Control drawings and including layout drawings.
    - e. Complete software "As-Built" diagrams.

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- G. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in City and Borough of Juneau s name and registered with manufacturer.

### **1.6 QUALITY ASSURANCE**

- A. The direct digital control system for this project shall be furnished and installed by the factory authorized Siebe Environmental Control (Barber-Colman) contractor in Alaska. The control Subcontractor shall maintain an office in Juneau or Anchorage with repair parts and maintenance personnel to ensure prompt response to an emergency call during the warranty period. The contractor shall maintain a complete sales, engineering, installation, and service organization.
- B. Perform work in accordance with NFPA 70.
- C. The control Subcontractor shall hold a license to design and install control systems for that Manufacturer.
- D. All work described in this section shall be installed, wired, circuit tested, and calibrated by factory trained electricians and mechanics qualified for this work and in the regular employment of the temperature control system manufacturer or its exclusive factory authorized installing contracting field office (representative). The installing office shall have a minimum of five years of installation experience with the manufacturer and shall provide documentation in submittal package verifying longevity of the installing company's relationship with the manufacture. Installation shall not be subcontracted. Supervision, calibration and checkout of the system shall be by the employees of the local exclusive factory authorized temperature control contracting field office (branch or representative). The employees of the installing office shall be factory trained with training certification documentation provided in submittal package.
- E. All materials and equipment used shall be standard components, of regular manufacture for this application. All systems and components shall have been thoroughly tested and proven in actual use. Barber-Colman/Siebe Environmental Control products are used as the basis of the design. Exceptions to the specification will qualify the bid as unacceptable.
- F. Design system software under direct supervision of a Professional Engineer experienced in design of this Work and licensed at Juneau, Alaska.
- G. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- H. Installer Qualifications: Company specializing in performing the work of this section with minimum 3 years experience approved by manufacturer.
- I. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.
- J. Scope of Work:

- 1. This specification describes the primary products and performance of the automatic control

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system. Sequences of operation and the schematic control diagrams shown on Drawings M600's detail the scope of work for this project.

2. The automatic control system shall be comprised of Siebe (Barber-Colman) control equipment. The BAS system shall be Network 8000 equipment and field devices and be fully compatible with the existing Bartlett Regional Hospital Direct Digital Control system. The DDC system shall provide stand-alone DDC control for all designated equipment described in the sequence of operation and show on the control schematics. The distributed DDC equipment shall be networked to Global Digital Controllers located in the Bartlett Regional Hospital Mechanical Areas and connected to the existing central operators station (Host) to provide a complete facility management system.
3. Work shall also include the conversion of air handling unit systems from pneumatic to direct digital controls.
4. Modem communication shall be available for backup if a problem arises with the communication bus. The existing central operators station (Host) computer with existing "Signal" graphical software will be used for displaying the additional graphic screens associated with this project.
5. The BAS shall be connected to GDC and the Host computer for remote monitoring, control, and data trending.
6. Work shall be done in sequential phases, coordinate work with CONTRACTOR.

### **1.7 WARRANTY**

- A. See Section 017700 - Closeout Submittals, for additional warranty requirements.
- B. A warranty period of one year shall commence upon acceptance of the system by the OWNER. The warranty shall consist of providing parts and labor as required to repair and replace parts of the control system that prove to be faulty due to defective materials or improper installation practices or troubleshooting control sequences that are not operating as specified. Included is reprogramming of the system software to include changes in the point descriptions as requested by the OWNER. The warranty excludes normal routine maintenance.
- C. Provide five year manufacturer's warranty for field programmable micro-processor based units.

### **1.8 MAINTENANCE SERVICE**

- A. Provide service and maintenance of energy management and control systems for one year from Date of Substantial Completion.
- B. Provide two complete inspections per year, one in each season, to inspect, calibrate, and adjust controls as required, and submit written reports.
- C. Provide complete service of systems, including call backs in addition to normal service calls to inspect, calibrate, and adjust controls, and submit written reports.

### **1.9 COORDINATION**

- A. Equipment: Control Subcontractor shall supply control equipment for installation by equipment

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suppliers and Mechanical Subcontractor where required. This includes all control equipment installed in piping systems such as thermostat wells and automatic valves. Control Subcontractor shall also coordinate locations of control equipment, including, but not limited to, thermostats, dampers and valve actuators, thermostat bulbs and averaging elements.

- B. During the adjustment of the mechanical systems, air and water, the BAS Subcontractor shall provide a trained technician on-site to help the Adjustment Contractor with their balancing procedures including any software required to interface with the control sequence. Responsibility for coordination of the times is included under the automatic controls.

### **1.10 TRAINING**

- A. After substantial completion and prior to final completion of the installation, operating personnel of the Bartlett Regional Hospital Maintenance shall be instructed on site in the sequence of operation and maintenance of the system hardware and software by the Subcontract's qualified representative. A minimum 6 hours of training is to be provided. Coordinate with OWNER to determine the nature of training to be provided.
- B. Subcontractor is to provide minimum of 7 days notice to the Bartlett Regional Hospital Maintenance Director prior to training and warranty visits.

### **1.11 EXTRA MATERIALS**

- A. See Section 016000 - Product Requirements, for additional provisions.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Siebe-Invensys Environmental Controls Network 8000. No substitutions.

### **2.2 CONTROL PANELS**

- A. Utilize cabinet type for each system under automatic control with relays and controls viewable from LCD screens.
- B. NEMA 250, general purpose utility enclosures with enameled finished face panel.
- C. Provide common keying for all panels.
- D. Use spare spaces in existing panel. Only install new panel if required.

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### **2.3 SENSING AND CONTROL OUTPUT REQUIREMENTS**

- A. Sensing: All sensing inputs shall be provided via industry standard signals. Temperature, humidity, differential pressure signals, and other signal inputs shall be one of the following types: 0-20 mA; 4-20 mA; 0-5 VDC; 0-12 VDC; 1000 ohm platinum (at 0 C, 2.62 ohms/°C); 1000 ohm Balco (2.2 ohms/°F); 10 k ohm Thermistor (at 25°C/77°F). All signal inputs shall be compatible with the controllers used and with the requirements for readout of variables in true scaled engineering units as specified.
- B. Control Outputs:
  - 1. The control panel shall internally provide test points for the circuits driving the equipment contactor, for the purpose of troubleshooting the 120 VAC circuit to the contactor. All such relays shall be of modular construction that can be easily and quickly replaced on an individual basis if the module were to be damaged.
  - 2. Modulating outputs shall be industry standard 0-5 VDC, or 0-12 VDC with defineable output spans to adapt to industry available control products. Milliamp outputs of 0-20 mA or 4-20 mA are also acceptable. Drive open/Drive closed type modulating outputs are acceptable for selected terminal unit control.

### **2.3 SENSORS**

- A. General:
  - 1. Provide sensors with specified output type for remote sensing of temperature. Suitable for medium where used, system conditions, and ambient temperature.
  - 2. Provide two wire temperature sensors.
- B. Space Temperature:
  - 1. Thermostats: Provide thermostats equal to the thermostats provided for CV controllers. Thermostats shall have unoccupied override capability and occupant setpoint adjustment with visual indication of thermostat in override status.
- C. Duct Air Temperature, Probe Type: With separable, perforated bulb guard. Thermistor or RTD with minimum 32-150°F range, accuracy of +/-0.4°F over full range, and maximum drift of 0.1°F/year. Siebe TS- 5700 series, Siebe TS-8000 series, Mamac TE 205 series or equal.

### **2.4 SWITCHES**

- A. Low Temperature Limit Switch: 4-wire, two SPDT switches, main contacts open on temperature below setpoint, pilot contacts close. Auto-reset unless otherwise indicated. Extended length capillary type element with any one foot at setpoint causing trip. Freeze protection low limit minimum range 0-60°F. Suitable for ambient temperatures -40 to 140°F. Siebe T-5232 or equal.

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### **B. Current Sensing Switches:**

1. Current operated solid state switch, 0.5 to 200 amp amperage range. Mini solid-core or split-core for fixed loads. Veris H-800 series or equal.
2. Current operated solid state switch with adjustable set-point from 1 to 135 amps. Power and status LED's, non-polarity sensitive. For detecting belt loss and motor failure. Veris H-708 solid-core, H-908 split-core or equal.

### **2.5 CONTROL VALVES**

- A. Automatic Valves: For water or steam, as applicable, suitable for system conditions. 2-inch and smaller: Brass body, threaded, installed with union on each connection. 2-1/2 inch and larger: Iron body, flanged. Seats and discs or plugs of nonferrous metals. Modulating or positive acting as required. See Contract Documents for operation and capacity.
- B. Positive-acting: Flat, single discs with renewable composition faces.
- C. Modulating: Single or balanced, parabolic or V-notched inner valve plug. Steam valves single seat type for tight shutoff.
- D. General: For steam or hot water as applicable.
  1. Non-terminal unit control valves (1/2" through 3") sizes shall have cast bronze bodies with static pressure rating conforming to ANSI B16.15- 1971 250 PSIG rating. Maximum water pressure shall be 400 PSIG with 40 to 150°F water, decreasing to 321 PSIG at the maximum water temperature of 281°F.
  2. All valves shall have stainless-steel stems, brass or stainless-steel throttling plugs, bronze valve seats, and spring-loaded Teflon -cone packing. Two-way valve plugs for non-steam applications shall have composition disks.
  3. All valves shall be fully modulating unless otherwise indicated. CONTROL CONTRACTOR is responsible for the selection of the proper control valves for the project including sizing, pressure rating, flow coefficient, flow characteristic, close-off rating, and actuator selection.
  4. All two-way valves shall have contoured or characterized throttling plugs with linear (for steam applications) or equal- percentage flow characteristics.
  5. Positive Acting Control Valves for Finned Tube Convectors and Cabinet Unit Heaters:
  8. Forged brass body, stainless steel base and bearing plate, electrolyte nickel brass stem, paddle and stem seal assembly compatible with heating system fluid, fully rated for 300 psi operating pressure limit. High temperature model if needed for 250°F fluid temperature. Powerhead replaceable without removal of valve body from system and secured to valve body with machine screws and sealed with O ring. Maximum close-off pressure rating of 20 psi minimum. Minimum Cv rating of 1.0, maximum of 7.0. Manual opening lever on all normally-closed valves. Available with sealed or unsealed end switches if required by the application.



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### **2.6 DAMPER AND VALVE ACTUATORS**

#### **A. General:**

1. Where exposed to outdoor air or air temperatures lower than 50°F, provide completely weatherproof actuators with internal heaters to allow normal operation at -50°F.
2. Provide spring return to normal position type actuators with variable air volume terminal units actuators return to closed position.

#### **B. Modulating Electronic Actuators:**

1. Modulating actuators for control dampers and control valves over 1-1/4" to convert electronic 1-10 VDC, or 4-20 mA analog signal to a linear, positive positioning stroke. Direct mount type with appropriate valve and damper linkage kits as needed. Siebe MS-7203, MS-7433 or equal.
2. Modulating actuators for control valves up to 1-1/4" to be hydraulic type with spring return. Proportional control by variable Vdc input signal. Siebe MP-5213 or equal.

#### **C. Two-Position Electronic Actuators:**

1. Two-position actuators for larger valves and dampers shall be gear train type or direct mount type as required. Siebe MA-418 or Siebe MA-7000 series or equal. Provide integral, adjustable end switches as required for the application.
2. Two-position actuators for small valves and dampers shall be direct mount type or hydraulic type as required. Siebe MA-5000 or Siebe MA-7000 series or equal. Provide integral, adjustable end switches as required for the application.

### **2.7. WIRING**

#### **A. Includes all control wiring to complete the system and provide control arrangements specified or shown on the drawings. Power or interlock wiring shall be run in separate conduits from sensor and communications wiring.**

1. Low-voltage Control Wiring (12-24v): Protected in exposed locations including, but not limited to, mechanical rooms and storage rooms. Plenum rated cable installed in ceiling plenums above ceilings. Motor disconnect switch shall also disconnect control circuit. Indicating lights wired from the motor terminals or from the last controlling device to the motor to show actual operation. All low voltage control wiring 18 AWG minimum.
2. 110-volt and larger Control Wiring: 12 AWG minimum if directly operating a motor, and 14 AWG minimum if controlling relays and holding coils.

#### **B. Control Power: Control Power will be provided under the Electrical Division. The power will be available in J-boxes located in the Mechanical and Fan Rooms. Provide the electrical connection between all automatic control equipment and the control power J-boxes.**

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### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify that conditioned power supply is available to the control units and to the operator work station. Verify that field end devices, wiring, and pneumatic tubing is installed prior to installation proceeding.

#### **3.2 WIRING AND RACEWAYS**

- A. General:
  - 1. Provide wiring, conduits and raceway complying with the National Electrical Code, Division 16, State and Local Codes and Ordinances. See electrical drawings for hazardous (classified) locations.
  - 2. Existing control conduit and junction boxes may be used by the CONTRACTOR.
  - 3. Low voltage wiring to the perimeter heat automatic valves shall be installed in conduit where stud walls are not available to conceal wiring. Where surface mount raceways are installed by the electrical Subcontractor for low voltage data wiring, the low voltage control wiring may be installed within. Coordinate with Electrical for locations.
  - 4. Use EMT, metal duct, IMC, rigid conduit, surface metal raceways, or totally enclosed metal through with flexible metal tubing as required by Division 16.
  - 5. Provide wire with copper stranded conductors. Provide color or number coded jackets.
  - 6. Provide 20 gauge minimum foil-shielded cable rated 100 VDC at 80 C. for input/output wiring.
  - 7. Provide communications network wiring meeting the gauge, impedance, capacitance, resistance and shielding requirements specified by the manufacturer of the connected devices.
  - 8. Plenum rated cable is acceptable in concealed, accessible areas such as suspended ceilings.
  - 9. Install wiring in a neat and orderly manner generally running piping and wiring along building lines.
  - 10. Seal conduit penetrations at rated walls with fire-stopping installed in accordance with fire-stopping manufacturers UL listed installation requirements.
  - 11. Wire all electrical controls and switches furnished under this section of the Specifications.
  - 12. Support and conceal wiring in finished areas.
  - 13. Support control wiring per electrical specifications.

#### **3.3 INSTALLATION**

- A. Install control units and other hardware in position on permanent walls where not subject to excessive vibration.
- B. Install software in control units and in operator work station. Implement all features of programs to specified requirements and appropriate to sequence of operation. Refer to Section 230993.

## **SECTION 230923 - DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC**

- C. Provide conduit and electrical wiring in accordance with Section 26 2717. Electrical material and installation shall be in accordance with appropriate requirements of Division 26.

### **3.4 COORDINATION**

- A. Coordinate this work with the work of other trades, and make arrangements for the complete and proper accomplishment of all related work. Coordinate required control interlocks with HVAC manufacturers or local representatives as necessary.
- B. Mechanical Subcontractor Responsibilities: Installs automatic valves and separable wells that are supplied by the Temperature Control Subcontractor.
- C. Temperature Control Subcontractor to install orifice in humidity control valve in AHU-15. Owner to provide orifice.

### **3.5 TESTING AND ADJUSTING**

- A. Upon completion of the control installation, start up the system, perform necessary testing, and adjust the system to ensure proper operation.
- B. Coordinate the final adjustments and “fine tuning” of control functions and devices so the mechanical systems and the control systems operate and respond as an integrated comfortable and energy efficient component of this facility.

### **3.6 ACCEPTANCE TESTING**

- A. Point Verification:
  - 1. To verify end-to-end operation of the system, the Subcontractor shall provide a hard copy of an All Points Summary Listing to the Owner of each part or system to be placed in warranty by the Owner. For CHS systems, the Subcontractor shall additionally provide a print screen of the process display showing real time dynamic point information for all points on the subsystem(s) to be accepted.
  - 2. Sequence Verification:
  - 3. The Contractor shall notify the Owner of systems which perform all specified sequences. The ARCHITECT shall verify all sequences of operation and place the system into warranty acceptance test.

### **3.7 WARRANTY ACCESS**

- A. The Owner shall grant to the Subcontractor, reasonable access to the Bas system during the warranty period.
- B. Access to the entire facility control system by the Subcontractor to provide service and diagnostic support.

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- C. Access by the owner from off-site for similar purposes and for remote operation, monitoring, and adjustment of facility functions.

### **3.8 SEQUENCE OF OPERATIONS**

- A. See Sheets M600's for Sequence of Operations and points list

**END OF SECTION 230923**

## **SECTION 230993 - SEQUENCE OF OPERATIONS FOR HVAC CONTROLS**

### **PART 1 - GENERAL**

#### **1.1 SECTION INCLUDES**

- A. This section defines the manner and method by which controls function. Requirements for each type of control system operation are specified. Equipment, devices, and system components required for control systems are specified in other sections.
- B. Sequence of operation for:
  - 1. Central fan systems.
  - 2. Fan coil units.
  - 3. Heating Coils.
  - 4. Radiant panels.
  - 5. Radiation and convectors.
  - 6. Terminal air units.
  - 7. Exhaust fans.

#### **1.2 RELATED SECTIONS**

- A. Section 230923 - Direct-Digital Control System for HVAC.
- B. Section 262726 – Wiring Devices: Electrical characteristics and wiring connections.
- C. Drawings and General provisions of the Contract, including General, Supplementary Conditions, and all Division Specifications Section, apply to this section.

#### **1.3 SUBMITTALS**

- A. See Section 013300 - Administrative Requirements, for submittal procedures.
- B. Sequence of Operation Documentation: Submit written sequence of operation for entire HVAC system and each piece of equipment.
  - 1. Preface: 1 or 2 paragraph overview narrative of the system describing its purpose, components and function.
  - 2. State each sequence in small segments and give each segment a unique number for referencing in Functional Test procedures; provide a complete description regardless of the completeness and clarity of the sequences specified in the contract documents.
  - 3. Include at least the following sequences:
    - a. Start-up.
    - b. Warm-up mode.
    - c. Normal operating mode.
    - d. Unoccupied mode.

## **SECTION 230993 - SEQUENCE OF OPERATIONS FOR HVAC CONTROLS**

- e. Shutdown.
  - f. Capacity control sequences and equipment staging.
  - g. Temperature and pressure control, such as setbacks, setups, resets, etc.
  - h. Detailed sequences for all control strategies, such as economizer control, optimum start/stop, staging, optimization, demand limiting, etc.
  - i. Effects of power or equipment failure with all standby component functions.
  - j. Sequences for all alarms and emergency shut downs.
  - k. Seasonal operational differences and recommendations.
4. Include initial and recommended values for all adjustable settings, setpoints and parameters that are typically set or adjusted by operating staff; and any other control settings or fixed values, delays, etc. that will be useful during testing and operating the equipment.
  5. For packaged controlled equipment, include manufacturer's furnished sequence of operation amplified as required to describe the relationship between the packaged controls and the control system, indicating which points are adjustable control points and which points are only monitored.
- C. Control System Diagrams: Submit graphic schematic of the control system showing each control component and each component controlled, monitored, or enabled.
1. Label with settings, adjustable range of control and limits.
  2. Include flow diagrams for each control system, graphically depicting control logic.
  3. Include the system and component layout of all equipment that the control system monitors, enables or controls, even if the equipment is primarily controlled by packaged or integral controls.
  4. Include draft copies of graphic displays indicating mechanical system components, control system components, and controlled function status and value.
  5. Include all monitoring, control and virtual points specified in elsewhere.
  6. Include a key to all abbreviations.
- D. Points List: Submit list of all control points indicating at least the following for each point.
1. Name of controlled system.
  2. Point abbreviation.
  3. Point description; such as dry bulb temperature, airflow, etc.
  4. Display unit.
  5. Control point or setpoint (Yes / No); i.e. a point that controls equipment and can have its setpoint changed.
  6. Monitoring point (Yes / No); i.e. a point that does not control or contribute to the control of equipment but is used for operation, maintenance, or performance verification.
  7. Intermediate point (Yes / No); i.e. a point whose value is used to make a calculation which then controls equipment, such as space temperatures that are averaged to a virtual point to control reset.
  8. Calculated point (Yes / No); i.e. a "virtual" point generated from calculations of other point values.
- E. Project Record Documents: Record actual locations of components and setpoints of controls, including changes to sequences made after submission of shop drawings.

## **SECTION 230993 - SEQUENCE OF OPERATIONS FOR HVAC CONTROLS**

### **1.4 QUALITY ASSURANCE**

- A. Design system under direct supervision of a Professional Engineer experienced in design of this Work and licensed at Juneau, Alaska.

### **PART 2 - PRODUCTS - NOT USED**

### **PART 3 - EXECUTION**

- 3.1 SEQUENCES: See Drawings.

**END OF SECTION 230993**

## SECTION 232113 - HYDRONIC PIPING

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Pipe and pipe fittings for:
  - 1. Heating water piping system.
  - 2. Chilled water piping system.
  - 3. Equipment drains and overflows.
- B. Valves:
  - 1. Gate valves.
  - 2. Ball valves.
  - 3. Check valves.

#### 1.2 RELATED REQUIREMENTS

- A. Section 083113 - Access Doors and Panels.
- B. Section 099123- Painting and Coating.
- C. Section 220553 - Identification for Plumbing Piping and Equipment.
- D. Section 220719 - Plumbing Piping Insulation.
- E. Section 230553 - Identification for HVAC Piping and Equipment.
- F. Section 230719 - HVAC Piping Insulation.
- G. Section 232114 - Hydronic Specialties.
- H. Drawings and General provisions of the Contract, including General, Supplementary Conditions, and all Division Specifications Section, apply to this section.

#### 1.3 REFERENCE STANDARDS

- A. ASME (BPV IX) - Boiler and Pressure Vessel Code, Section IX - Welding and Brazing Qualifications; The American Society of Mechanical Engineers; 2007.
- B. ASME B16.3 - Malleable Iron Threaded Fittings; The American Society of Mechanical Engineers; 1998 (R2006).
- C. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers; 2001 (R2005) (ANSI B16.18).
- D. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings; The



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American Society of Mechanical Engineers; 2001 (R2005).

- E. ASME B31.5 - Refrigeration Piping and Heat Transfer Components; The American Society of Mechanical Engineers; 2006.
- F. ASME B31.9 - Building Services Piping; The American Society of Mechanical Engineers; 2004 (ANSI/ASME B31.9).
- G. ASTM B 32 - Standard Specification for Solder Metal; 2004.
- H. ASTM B 88 - Standard Specification for Seamless Copper Water Tube; 2003.
- I. ASTM B 88M - Standard Specification for Seamless Copper Water Tube (Metric); 2005.
- J. AWS A5.8/A5.8M - Specification for Filler Metals for Brazing and Braze Welding; American Welding Society; 2004 and errata.
- K. AWWA C606 - Standard Specification for Grooved and Shouldered Joints; American Water Works Association; 2006.
- L. MSS SP-58 - Pipe Hangers and Supports - Materials, Design and Manufacture; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2009.
- M. MSS SP-69 - Pipe Hangers and Supports - Selection and Application; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2003.
- N. MSS SP-89 - Pipe Hangers and Supports - Fabrication and Installation Practices; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2003.

### 1.4 SUBMITTALS

- A. See Section 013300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Include data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalogue information. Indicate valve data and ratings.
- C. Project Record Documents: Record actual locations of valves.
- D. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.
- E. Maintenance Materials: Furnish the following for City and Borough of Juneau's use in maintenance of project.
  - 1. See Section 016000 - Product Requirements, for additional provisions.
  - 2. Valve Repacking Kits: One for each type and size of valve.

### 1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with minimum three years of documented experience.

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- B. Installer Qualifications: Company specializing in performing work of the type specified in this section, with minimum 3 years of experience.

### **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary protective coating on cast iron and steel valves.
- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

## **PART 2 - PRODUCTS**

### **2.1 HYDRONIC SYSTEM REQUIREMENTS**

- A. Comply with ASME B31.9 and applicable federal, state, and local regulations.
- B. Piping: Provide piping, fittings, hangers and supports as required, as indicated, and as follows:
  - 1. Where more than one piping system material is specified, provide joining fittings that are compatible with piping materials and ensure that the integrity of the system is not jeopardized.
  - 2. Use non-conducting dielectric connections whenever jointing dissimilar metals.
  - 3. Provide pipe hangers and supports in accordance with ASME B31.9 unless indicated otherwise.
- C. Pipe-to-Valve and Pipe-to-Equipment Connections: Use flanges, unions, or grooved couplings to allow disconnection of components for servicing; do not use direct welded, soldered, or threaded connections.
- D. Valves: Provide valves where indicated and as follows:
  - 1. Provide drain valves where indicated, and if not indicated provide at least at main shut-off, low points of piping, bases of vertical risers, and at equipment. Use 3/4 inch gate valves with cap; pipe to nearest floor drain.
  - 2. For throttling, bypass, or manual flow control services, use globe, ball, or butterfly valves.
  - 3. For isolation service in chilled water systems, use only ball valves.
  - 4. For shut-off and to isolate parts of systems or vertical risers, use gate or ball valves.

### **2.2 HEATING WATER PIPING, ABOVE GROUND**

- A. Copper Tube: ASTM B 88, Type L, drawn, using one of the following joint types:

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1. Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22 solder wrought copper fittings.
  - a. Solder: ASTM B 32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.
  - b. Braze: AWS A5.8/A5.8M BCuP copper/silver alloy.
  - c. Propress type joint systems are acceptable.

### 2.3 CHILLED WATER PIPING, ABOVE GRADE

A. Copper Tube: ASTM B 88, Type L, hard drawn; using one of the following joint types:

1. Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22, solder wrought copper fittings.
  - a. Solder: ASTM B 32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.
  - b. Braze: AWS A5.8/A5.8M BCuP copper/silver alloy.
  - c. Propress type joint systems are acceptable.

### 2.4 RADIANT HEATING PIPING

A. Copper Tube: ASTM B 88, Type L hard drawn; using one of the following joint types.

1. Fittings: ASME B16.22, wrought copper.
2. Joints: Solder, lead free, ASTM B 32, HB alloy (95-5 tin-antimony), or tin and silver.
3. Propress type joint systems are acceptable.

### 2.5 EQUIPMENT DRAINS AND OVERFLOWS

A. Copper Tube: ASTM B 88, Type L, drawn; using one of the following joint types:

1. Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22 solder wrought copper fittings; ASTM B 32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.
2. Grooved Joints: AWWA C606 grooved pipe, fittings of same material, and mechanical couplings.

### 2.6 PIPE HANGERS AND SUPPORTS

- A. Conform to ASME B31.9.
- B. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch: Malleable iron, adjustable swivel, split ring.
- C. Hangers for Cold Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
- D. Hangers for Hot Pipe Sizes 2 to 4 Inches: Carbon steel, adjustable, clevis.
- E. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
- F. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 Inches and Over: Steel channels with welded

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spacers and hanger rods, cast iron roll.

- G. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
- H. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
- I. Wall Support for Hot Pipe Sizes 6 Inches and Over: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron roll.
- J. Vertical Support: Steel riser clamp.
- K. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
- L. Floor Support for Hot Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
- M. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- N. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.
- O. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

### 2.7 UNIONS, FLANGES, AND COUPLINGS

- A. Unions for Pipe 2 Inches and Under:
  - 1. Ferrous Piping: 150 psig malleable iron, threaded.
  - 2. Copper Pipe: Bronze, soldered joints.
- B. Flanges for Pipe Over 2 Inches:
  - 1. Ferrous Piping: 150 psig forged steel, slip-on.
  - 2. Copper Piping: Bronze.
  - 3. Gaskets: 1/16 inch thick preformed neoprene.
- C. Mechanical Couplings for Grooved and Shouldered Joints: Two or more curved housing segments with continuous key to engage pipe groove, circular C-profile gasket, and bolts to secure and compress gasket.
  - 1. Dimensions and Testing: In accordance with AWWA C606.
  - 2. Housing Material: Malleable iron or ductile iron, galvanized.
  - 3. Bolts and Nuts: Hot dipped galvanized or zinc-electroplated steel.
  - 4. When pipe is field grooved, provide coupling manufacturer's grooving tools.
- D. Dielectric Connections: Union or waterway fitting with water impervious isolation barrier and one galvanized or plated steel end and one copper tube end, end types to match pipe joint types used.

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### 2.8 GATE VALVES

#### A. Manufacturers:

1. Tyco Flow Control: [www.tycoflowcontrol.com](http://www.tycoflowcontrol.com).
2. Conbraco Industries: [www.conbraco.com](http://www.conbraco.com).
3. Nibco, Inc: [www.nibco.com](http://www.nibco.com).

#### B. Up To and Including 2 Inches:

1. Bronze body, bronze trim, screwed bonnet, non-rising stem, lockshield stem, inside screw with backseating stem, solid wedge disc, alloy seat rings, solder ends.

### 2.9 BALL VALVES

#### A. Manufacturers:

1. Tyco Flow Control: [www.tycoflowcontrol.com](http://www.tycoflowcontrol.com).
2. Conbraco Industries: [www.conbraco.com](http://www.conbraco.com).
3. Nibco, Inc: [www.nibco.com](http://www.nibco.com).
4. Victaulic Company: [www.victaulic.com](http://www.victaulic.com).

#### B. Up To and Including 2 Inches:

1. Bronze one piece body, chrome plated brass ball, full port, teflon seats and stuffing box ring, lever handle with balancing stops, solder ends with union.

### 2.10 SWING CHECK VALVES

#### A. Manufacturers:

1. Tyco Flow Control: [www.tycoflowcontrol.com](http://www.tycoflowcontrol.com).
2. Nibco, Inc: [www.nibco.com](http://www.nibco.com).
3. Victaulic Company: [www.victaulic.com](http://www.victaulic.com).

#### B. Up To and Including 2 Inches:

1. Bronze body, bronze trim, bronze rotating swing disc, with composition disc, solder ends.

### 2.11 SPRING LOADED CHECK VALVES

#### A. Manufacturers:

1. Tyco Flow Control: [www.tycoflowcontrol.com](http://www.tycoflowcontrol.com).
2. Hammond Valve: [www.hammondvalve.com](http://www.hammondvalve.com).
3. Crane Co.: [www.cranevalve.com](http://www.cranevalve.com).
4. Victaulic Company: [www.victaulic.com](http://www.victaulic.com).

#### B. Iron body, bronze trim, split plate, hinged with stainless steel spring, resilient seal bonded to

## SECTION 232113 - HYDRONIC PIPING

body, wafer or threaded lug ends.

### PART 3 - EXECUTION

#### 3.1 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Prepare pipe for grooved mechanical joints as required by coupling manufacturer.
- C. Remove scale and dirt on inside and outside before assembly.
- D. Prepare piping connections to equipment using jointing system specified.
- E. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.
- F. After completion, fill and clean systems.

#### 3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install heating water and chilled water piping to ASME B31.9 requirements. Install chilled water piping to ASME B31.5 requirements.
- C. Route piping in orderly manner, parallel to building structure, and maintain gradient.
- D. Install piping to conserve building space and to avoid interfere with use of space.
- E. Group piping whenever practical at common elevations.
- F. Slope piping and arrange to drain at low points.
- G. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- H. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- I. Pipe Hangers and Supports:
  - 1. Install in accordance with ASME B31.9.
  - 2. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
  - 3. Place hangers within 12 inches of each horizontal elbow.
  - 4. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
  - 5. Support vertical piping at every other floor. Support riser piping independently of

## **SECTION 232113 - HYDRONIC PIPING**

- connected horizontal piping.
6. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
  7. Provide copper plated hangers and supports for copper piping.
- J. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 220719.
- K. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with Section 083113.
- L. Use eccentric reducers to maintain top of pipe level.
- M. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.
- N. Prepare unfinished pipe, fittings, supports, and accessories, ready for finish painting. Refer to Section 099123.
- O. Install valves with stems upright or horizontal, not inverted.
- P. Piping Tests: All heating piping tested hydrostatically at 125 psi for minimum of four hours. System shall remain tight for test period without leaks, displacement, or straining. Equipment, gauges, and thermometer wells rated for lesser pressure suitable protected during tests. Leaks developed during test shall be corrected without caulking and test restarted until a perfectly tight system is obtained. Enclosed piping tested before concealing. Test performed in presence of Owner.

**END OF SECTION 232113**

## **SECTION 232114 - HYDRONIC SPECIALTIES**

### **PART 1 - GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Air vents.
- B. Strainers.
- C. Flow setters.

#### **1.2 RELATED REQUIREMENTS**

- A. Section 221006 - Plumbing Piping Specialties: Backflow Preventers.
- B. Section 232113 - Hydronic Piping.
- C. Drawings and General provisions of the Contract, including General, Supplementary Conditions, and all Division Specifications Section, apply to this section.

#### **1.3 REFERENCE STANDARDS**

- A. ASME (BPV VIII, 1) - Boiler and Pressure Vessel Code, Section VIII, Division 1 - Rules for Construction of Pressure Vessels; The American Society of Mechanical Engineers; 2007.

#### **1.4 SUBMITTALS**

- A. See Section 013300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide product data for manufactured products and assemblies required for this project. Include component sizes, rough-in requirements, service sizes, and finishes. Include product description, model and dimensions.
- C. Manufacturer's Installation Instructions: Indicate hanging and support methods, joining procedures.
- D. Project Record Documents: Record actual locations of flow controls.
- E. Maintenance Data: Include installation instructions, assembly views, lubrication instructions, and replacement parts list.
- F. Maintenance Materials: Furnish the following for City and Borough of Juneau's use in maintenance of project.
  - 1. See Section 016000 - Product Requirements, for additional provisions.



## **SECTION 232114 - HYDRONIC SPECIALTIES**

### **1.5 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

### **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- C. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

## **PART 2 - PRODUCTS**

### **2.1 AIR VENTS**

- A. Manufacturers:
  - 1. Armstrong International, Inc: [www.armstronginternational.com](http://www.armstronginternational.com).
  - 2. ITT Bell & Gossett: [www.bellgossett.com](http://www.bellgossett.com).
  - 3. Taco, Inc: [www.taco-hvac.com](http://www.taco-hvac.com).
- B. Manual Type: Short vertical sections of 2 inch diameter pipe to form air chamber, with 1/8 inch brass needle valve at top of chamber.
- C. Float Type:
  - 1. Brass or semi-steel body, copper, polypropylene, or solid non-metallic float, stainless steel valve and valve seat; suitable for system operating temperature and pressure; with isolating valve.
  - 2. Cast iron body and cover, float, bronze pilot valve mechanism suitable for system operating temperature and pressure; with isolating valve.

### **2.2 STRAINERS**

- A. Manufacturers:
  - 1. Armstrong International, Inc: [www.armstronginternational.com](http://www.armstronginternational.com).
  - 2. Green Country Filtration: [greencountryfiltration.com](http://greencountryfiltration.com).
  - 3. WEAMCO: [www.weamco.com](http://www.weamco.com).

## **SECTION 232114 - HYDRONIC SPECIALTIES**

### **B. Size 2 inch and Under:**

1. Screwed brass or iron body for 175 psi working pressure, Y pattern with 1/32 inch stainless steel perforated screen.

### **C. Size 2-1/2 inch to 4 inch:**

1. Flanged iron body for 175 psi working pressure, Y pattern with 3/64 inch stainless steel perforated screen.

## **2.3 FLOWSETTERS**

### **A. Manufacturers:**

1. ITT Bell & Gossett.
2. Griswold Controls.
3. Taco, Inc.

- B. Construction:** Angle or straight pattern, inside screw globe or ball valve for 125 psig working pressure, with bronze body and integral union for screwed connections, renewable composition disc, plastic wheel handle for shut-off service, and lock-shield key cap and set screw memory bonnet for balancing service. 1/2 inch or 3/4 inch may be sweat type ends. Valve bodies to have differential read-out port and caps. Provide three probe adapters for meter reading. Provide two spare read-out port caps.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Install specialties in accordance with manufacturer's instructions.
- B. Where large air quantities can accumulate, provide enlarged air collection standpipes.
- C. Provide manual air vents at system high points and as indicated.
- D. For automatic air vents in ceiling spaces or other concealed locations, provide vent tubing to nearest drain.

**END OF SECTION 232114**

## **SECTION 232123 - HYDRONIC PUMPS**

### **PART 1 - GENERAL**

#### **1.1 SECTION INCLUDES**

- A. In-line circulators.

#### **1.2 RELATED REQUIREMENTS**

- A. Section 220719 - Plumbing Piping Insulation.
- B. Section 230719 - HVAC Piping Insulation.
- C. Section 232113 - Hydronic Piping.
- D. Section 232114 - Hydronic Specialties.
- E. Section 262726 – Wiring Devices: Electrical characteristics and wiring connections.
- F. Drawings and General provisions of the Contract, including General, Supplementary Conditions, and all Division Specifications Section, apply to this section.

#### **1.3 REFERENCE STANDARDS**

- A. NEMA MG 1 - Motors and Generators; National Electrical Manufacturers Association; 2007.
- B. NEMA OS 1 - Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; National Electrical Manufacturers Association; 2003.
- C. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.
- D. UL 778 - Standard for Motor-Operated Water Pumps; Underwriters Laboratories Inc.; 2002.

#### **1.4 SUBMITTALS**

- A. See Section 013300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide certified pump curves showing performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable. Include electrical characteristics and connection requirements.
- C. Manufacturer's Installation Instructions: Indicate hanging and support requirements and recommendations.
- D. Operation and Maintenance Data: Include installation instructions, assembly views, lubrication instructions, and replacement parts list.

## SECTION 232123 - HYDRONIC PUMPS

E. Maintenance Materials: Furnish the following for City and Borough of Juneau's use in maintenance of project.

1. See Section 016000 - Product Requirements, for additional provisions.
2. Extra Pump Seals: One set for each type and size of pump.

### 1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufactures, assembly, and field performance of pumps, with minimum three years of documented experience.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Armstrong Pumps Inc: [www.armstrongpumps.com](http://www.armstrongpumps.com).
- B. ITT Bell & Gossett: [www.bellgossett.com](http://www.bellgossett.com).
- C. Sterling Fluid Systems: [www.sterlingfluid.com](http://www.sterlingfluid.com).
- D. Taco Pumps.

### 2.2 HVAC PUMPS - GENERAL

- A. Provide pumps that operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.
- B. Minimum Quality Standard: UL 778.
- C. Products Requiring Electrical Connection: Listed and classified by UL or testing agency acceptable to authority having jurisdiction as suitable for the purpose specified and indicated.

### 2.3 SYSTEM LUBRICATED CIRCULATORS

- A. Type: Horizontal shaft, single stage, direct connected with multiple speed wet rotor motor for in-line mounting, for 140 psi maximum working pressure, 230 degrees F maximum water temperature.
- B. Casing: Cast iron with flanged pump connections.
- C. Impeller, Shaft, Rotor: Stainless Steel.
- D. Bearings: Metal Impregnated carbon (graphite) and ceramic.
- E. Motor: Impedance protected, multiple speed, with external speed selector.

## **SECTION 232123 - HYDRONIC PUMPS**

### **F. Performance:**

1. Flow Capacity: 13 gal/min.
2. Head: 10 feet.

### **G. Electrical Characteristics:**

1. 1/2 hp.
2. 115 volts, single phase, 60 Hz.

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

- A. Verify that electric power is available and of the correct characteristics.

### **3.2 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Provide access space around pumps for service. Provide no less than minimum space recommended by manufacturer.
- C. Decrease from line size with long radius reducing elbows or reducers. Support piping adjacent to pump such that no weight is carried on pump casings.
- D. Provide line sized shut-off valve and strainer on pump suction, and line sized soft seat check valve and balancing valve on pump discharge.

**END OF SECTION 232123**

## SECTION 233100 - HVAC DUCTS AND CASINGS

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Metal ductwork.
- B. Casing and plenums.

#### 1.2 RELATED REQUIREMENTS

- A. Section 230713 - Duct Insulation: External insulation and duct liner.
- B. Section 233300 - Air Duct Accessories.
- C. Section 233600 - Air Terminal Units.
- D. Section 233700 - Air Outlets and Inlets.
- E. Section 230593 - Testing, Adjusting, and Balancing for HVAC.
- F. Drawings and General provisions of the Contract, including General, Supplementary Conditions, and all Division Specifications Section, apply to this section.

#### 1.3 REFERENCE STANDARDS

- A. ASHRAE (FUND) - ASHRAE Handbook - Fundamentals; 2005.
- B. ASTM A 36/A 36M - Standard Specification for Carbon Structural Steel; 2005.
- C. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2007.
- D. ASTM A 1008/A 1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength, Low Alloy, and High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2007a.
- E. ASTM A 1011/A 1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low Alloy, High-Strength Low-Alloy With Improved Formability, and Ultra-High Strength; 2008.
- F. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2008.
- G. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; National Fire Protection Association; 2009.
- H. NFPA 90B - Standard for the Installation of Warm Air Heating and Air Conditioning Systems;

## **SECTION 233100 - HVAC DUCTS AND CASINGS**

National Fire Protection Association; 2009.

- I. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association; 2005.
- J. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; Underwriters Laboratories Inc.; 2005.

### **1.4 PERFORMANCE REQUIREMENTS**

- A. No variation of duct configuration or sizes permitted except by written permission. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts.

### **1.5 SUBMITTALS**

- A. See Section 013300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data for duct materials.
- C. Shop Drawings: Indicate duct fittings, particulars such as gages, sizes, welds, and configuration prior to start of work for systems.
- D. Test Reports: Indicate pressure tests performed. Include date, section tested, test pressure, and leakage rate, following SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual.
- E. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

### **1.6 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum 3 years of documented experience.

### **1.7 FIELD CONDITIONS**

- A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.
- B. Maintain temperatures within acceptable range during and after installation of duct sealants.

## SECTION 233100 - HVAC DUCTS AND CASINGS

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A 653/A 653M FS Type B, with G60/Z180 coating.
- B. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
  - 1. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
  - 2. Surface Burning Characteristics: Flame spread of zero, smoke developed of zero, when tested in accordance with ASTM E 84.
- C. Hanger Rod: ASTM A 36/A 36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.
- D. Insulated Flexible Ducts:
  - 1. Manufacturers:
    - a. Thermaflex
    - b. Thermoid
    - c. Wiremold
  - 2. UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound spring steel wire; fiberglass insulation; polyethylene vapor barrier film.
    - a. Pressure Rating: 10 inches WG positive and 1.0 inches WG negative.
    - b. Maximum Velocity: 4000 fpm.
    - c. Temperature Range: -20 degrees F to 210 degrees F.

#### 2.2 DUCTWORK FABRICATION

- A. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.
- B. Transfer Air and Sound Boots: 1/2 inch w.g. pressure class, fibrous glass.
- C. No variation of duct configuration or size permitted except by written permission. Size round duct installed in place of rectangular ducts in accordance with ASHRAE Handbook - Fundamentals.
- D. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- E. T's, bends, and elbows: Construct according to SMACNA (DCS).
- F. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible;



## SECTION 233100 - HVAC DUCTS AND CASINGS

maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

- G. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
- H. Fabricate continuously welded round and oval duct fittings two gages heavier than duct gages indicated in SMACNA Standard. Joints shall be minimum 4 inch cemented slip joint, brazed or electric welded. Prime coat welded joints.
- I. Provide standard 45 degree lateral wye takeoffs unless otherwise indicated where 90 degree conical tee connections may be used.
- J. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

### 2.3 DUCT MANUFACTURERS

- A. Metal-Fab, Inc: [www.mtlfab.com](http://www.mtlfab.com).
- B. SEMCO Incorporated: [www.semcoinc.com](http://www.semcoinc.com).
- C. United McGill Corporation: [www.unitedmcgill.com](http://www.unitedmcgill.com).

### 2.4 MANUFACTURED DUCTWORK AND FITTINGS

- A. Manufacture in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.

### 2.5 DUCT SEALANTS

- A. Sealant: UL listed vinyl acrylic or copolymer based duct sealant. Similar to Durodyne DSS-181, Uni-mastic 181.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install, support, and seal ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
- B. Install in accordance with manufacturer's instructions.
- C. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

## **SECTION 233100 - HVAC DUCTS AND CASINGS**

- D. Flexible Ducts: Connect to metal ducts with adhesive and draw bands.
- E. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.
- F. Install and seal metal and flexible ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
- G. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.
- H. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- I. Use double nuts and lock washers on threaded rod supports.
- J. Connect terminal units to supply ducts directly or with one foot maximum length of flexible duct. Do not use flexible duct to change direction.
- K. Connect diffusers to low pressure ducts directly or with 3 feet maximum length of flexible duct held in place with strap or clamp.
- L. Connect flexible ducts to metal ducts with adhesive and draw bands
- M. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
- N. At exterior wall louvers, seal duct to louver frame and install blank-out panels.
- O. Duct Sealing:
  - 1. Seal metal ducts and casing longitudinal and latitudinal joints with foil tape or sealant. Apply sealant in accordance with manufacturer's recommendations. Inspect seams with ductwork pressurized and reapply as required for an airtight application.

### **3.2 INTERFACE WITH OTHER PRODUCTS**

- A. Provide openings in ductwork where required to accommodate thermometers and controllers . Provide Pitot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.

### **3.3 CLEANING**

- A. If supply, exhaust, or return air ductwork is found to be dirty during construction due to inadequately capped/sealed ductwork or operating fans without filters, the CONTRACTOR shall clean all affected duct systems with high power vacuum machines to the satisfaction of the ARCHITECT. Return air plenums not sealed off during construction shall be cleaned by the

## **SECTION 233100 - HVAC DUCTS AND CASINGS**

CONTRACTOR to the satisfaction of the OWNER. Protect equipment that may be harmed by excessive dirt with filters, or bypass during cleaning. Provide adequate access into ductwork for cleaning purposes. All construction debris is to be removed by CONTRACTOR prior to cleaning.

### **3.4 DUCT LEAKAGE TESTING**

- A. Ductwork of 2.00 Inch wg or Less: All visible and audible leaks perceptible to Using Agency or ARCHITECT shall be sealed.

### **3.5 SCHEDULES**

- A. Ductwork Material:

- 1. Low Pressure Supply (Heating Systems): Steel.
- 2. Low Pressure Supply (System with Cooling Coils): Steel.
- 3. Return and Relief: Steel.
- 4. General Exhaust: Steel.
- 5. Outside Air Intake: Steel.

- B. Ductwork Pressure Class:

- 1. Supply (Heating Systems): 2 inch
- 2. Supply (System with Cooling Coils): 2 inch.
- 3. Return and Relief: 2 inch.
- 4. General Exhaust: 2 inch.
- 5. Outside Air Intake: 2 inch.

**END OF SECTION 233100**

## **SECTION 233300 - AIR DUCT ACCESSORIES**

### **PART 1 - GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Backdraft dampers.
- B. Duct access doors.
- C. Duct test holes.
- D. Flexible duct connections.
- E. Volume control dampers.
- F. Combination Fire and Smoke Dampers.

#### **1.2 RELATED REQUIREMENTS**

- A. Section 233100 - HVAC Ducts and Casings.
- B. Section 233600 - Air Terminal Units: Pressure regulating damper assemblies.
- C. Section 262726 – Wiring Devices: Electrical characteristics and wiring connections.
- D. Drawings and General provisions of the Contract, including General, Supplementary Conditions, and all Division Specifications Section, apply to this section.

#### **1.3 REFERENCE STANDARDS**

- A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; National Fire Protection Association; 2009.
- B. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association; 2005.
- C. UL 555 (Underwriters Laboratories, Inc.) – Fire Dampers.
- D. UL 555S (Underwriters Laboratories, Inc.) – Leakage Rated Dampers for Use in Smoke Control Systems.

#### **1.4 SUBMITTALS**

- A. See Section 013300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide for shop fabricated assemblies including volume control dampers, duct access doors, duct test holes, and hardware used. Include electrical characteristics and

## SECTION 233300 - AIR DUCT ACCESSORIES

connection requirements.

- C. Project Record Drawings: Record actual locations of access doors and test holes.
- D. Maintenance Materials: Furnish the following for City and Borough of Juneau's use in maintenance of project.
  - 1. See Section 016000 - Product Requirements, for additional provisions.

### 1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.
- B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect dampers from damage to operating linkages and blades.

### 1.7 COORDINATION

- A. Coordinate Work where appropriate with building fire alarm control Work.

## PART 2 - PRODUCTS

### 2.1 COMBINATION FIRE AND SMOKE DAMPER

- A. Manufacturers:
  - 1. Air Balance
  - 2. Greenheck
  - 3. Ruskin FSD-60
- B. Description : Duct mounted fire smoke damper.
- C. Fabricated and install in accordance with NFPA 90A, UL 555, and UL 555s.
- D. Multiple-Blade Damper: Fabricate with 16 gage galvanized steel frame and air foil blades. Provide oil-impregnated bronze or stainless steel sleeve and bearings and plated steel axles, stainless steel jamb seals, 1/8 x 1/2 inch plated steel concealed linkage, stainless steel closure spring, blade stops, and lock, and 1/2 inch actuator shaft. Damper shall operate (to open and close) under system operating conditions and pressure of 4.00 inches w.g. in the closed position and 2000 fpm velocity in open position. TS fire stat for remote reset.
- E. Operators: UL listed and labeled spring return electric type. Open upon activation of 120 volt,

## SECTION 233300 - AIR DUCT ACCESSORIES

single phase power. Locate damper operator on exterior of duct and link to damper operating shaft.

- F. Fire Dampers: Closing upon actuation of Electro thermal link, flexible stainless steel blade edge seals to provide constant sealing pressure, stainless steel springs with locking devices.
- G. Electro Thermal Link: Fusible link melting at 165 degrees F; 120 Volts, single phase, 60 Hz; UL listed and labeled.
- H. Coordinate electrical requirements with sensor and detector provided under divisions 26, 27, and 28.

### 2.2 BACKDRAFT DAMPERS

#### A. Manufacturers:

- 1. Louvers & Dampers, Inc: [www.louvers-dampers.com](http://www.louvers-dampers.com).
- 2. Nailor Industries Inc: [www.nailor.com](http://www.nailor.com).
- 3. PCI Industries, Inc; Pottorff Brand: [www.pottorff.com](http://www.pottorff.com).
- 4. Ruskin Company: [www.ruskin.com](http://www.ruskin.com).

- B. Gravity Backdraft Dampers, Size 18 x 18 inches or Smaller, Furnished with Air Moving Equipment: Air moving equipment manufacturer's standard construction.

### 2.3 DUCT ACCESS DOORS

#### A. Manufacturers:

- 1. Air Balance.
- 2. Durodyne.
- 3. Ruskin Company: [www.ruskin.com](http://www.ruskin.com).
- 4. SEMCO Incorporated: [www.semcoinc.com](http://www.semcoinc.com).
- 5. Ventlock.

- B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards – Metal and Flexible, and as indicated.

- C. Fabrication: Rigid and close-fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ducts, install minimum 1 inch thick insulation with sheet metal cover.

- 1. Less Than 12 inches Square: Secure with sash locks.
- 2. Up to 18 inches Square: Provide two small hinges or one continuous hinge and one compression latch.
- 3. Up to 24 x 48 inches: Three large hinges or one continuous hinge and two compression latches with outside and inside handles.
- 4. Sash Lock: Similar to Ventlock Model 90
- 5. Compression Latch: Similar to Ventlock Model 140, 202, or 310
- 6. Hinge: Small hinges to be zinc plated steel, minimum 3 x 2 inches wide or 2 inch wide

## SECTION 233300 - AIR DUCT ACCESSORIES

piano hinge. Similar to Ventlock Model 150, 157, or 167, 250.

7. Access panels with sheet metal screw fasteners are not acceptable.
- C. Access doors with sheet metal screw fasteners are not acceptable.

### 2.4 DUCT TEST HOLES

- A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.
- B. Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

### 2.5 FLEXIBLE DUCT CONNECTIONS

- A. Manufacturers:
  1. Elgen Manufacturing; [www.elgenmfg.com](http://www.elgenmfg.com).
  2. Duodyne
- B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.
- C. Flexible Duct Connections: Fabric crimped into metal edging strip.
  1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz per sq yd.
    - a. Net Fabric Width: Approximately 2 inches wide.

### 2.6 VOLUME CONTROL DAMPERS

- A. Manufacturers:
  1. Air Balance.
  2. Durodyne
  3. Greenheck.
  4. Ruskin Company:
  5. Ventlock
- B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.
- C. Splitter Dampers:
  1. Material: Same gage as duct to 24 inches size in either direction, and two gages heavier for sizes over 24 inches.
  2. Material: Same gage as duct to 24 inches size in either direction, and two gages heavier for

## SECTION 233300 - AIR DUCT ACCESSORIES

- sizes over 24 inches.
  - 3. Blade: Fabricate of single thickness sheet metal to streamline shape, secured with continuous hinge or rod.
  - 4. Operator: Minimum 1/4 inch diameter rod in self aligning, universal joint action, flanged bushing with set screw .
- D. Single Blade Dampers: Fabricate for duct sizes up to 6 x 30 inch.
- 1. Fabricate for duct sizes up to 6 x 30 inch.
  - 2. Blade: 24 gage, minimum.
- E. Multi-Blade Damper: Fabricate of opposed blade pattern. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.
- G. End Bearings: On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.
- H. Quadrants:
- 1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
  - 2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.
  - 3. Where rod lengths exceed 30 inches provide regulator at both ends.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Verify that electric power is available and of the correct characteristics.

### 3.2 INSTALLATION

- A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA HVAC Duct Construction Standards - Metal and Flexible. Refer to Section 23 3100 for duct construction and pressure class.
- B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.
- C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide minimum 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access, and as indicated. Provide 4 x 4 inch for balancing dampers only. Review locations prior to fabrication.
- D. Provide duct test holes where indicated and required for testing and balancing purposes.



## **SECTION 233300 - AIR DUCT ACCESSORIES**

- E. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.
- F. Use splitter dampers only where indicated.
- G. Provide balancing dampers on high velocity systems where indicated. Refer to Section 233600 - Air Terminal Units.
- H. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.
- I. Provide combination fire and smoke dampers at locations indicated on contract drawings. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.
- J. Install combination smoke and fire dampers in accordance with NFPA 92A. Sleeve duct through fire rated assembly as required.

### **3.3 DEMONSTATION AND TRAINING**

- A. Demonstrate re-setting of all dampers to Owner's Representative.

**END OF SECTION 233300**

## **SECTION 233423 - HVAC POWER VENTILATORS**

### **PART 1 - GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Roof exhausters.

#### **1.2 RELATED REQUIREMENTS**

- A. Section 233300 - Air Duct Accessories: Backdraft dampers.
- B. Section 262726 – Wiring Devices: Electrical characteristics and wiring connections.
- C. Drawings and General provisions of the Contract, including General, Supplementary Conditions, and all Division Specifications Section, apply to this section.

#### **1.3 REFERENCE STANDARDS**

- A. AMCA 99 - Standards Handbook; Air Movement and Control Association International, Inc.; 2003.
- B. AMCA 210 - Laboratory Methods of Testing Fans for Aerodynamic Performance Rating; Air Movement and Control Association International, Inc.; 2007 (ANSI/AMCA 210, same as ANSI/ASHRAE 51).
- C. AMCA (DIR) - [Directory of] Products Licensed Under AMCA International Certified Ratings Program; Air Movement and Control Association International, Inc.; <http://www.amca.org/licenses/search.aspx>.
- D. AMCA 300 - Reverberant Room Method for Sound Testing of Fans; Air Movement and Control Association International, Inc.; 2005.
- E. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data; Air Movement and Control Association International, Inc.; 2006.
- F. NEMA MG 1 - Motors and Generators; National Electrical Manufacturers Association; 2007.
- G. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; National Fire Protection Association; 2008.
- H. UL 705 - Power Ventilators; Underwriters Laboratories Inc.; 2006.

## **SECTION 233423 - HVAC POWER VENTILATORS**

### **1.4 SUBMITTALS**

- A. See Section 013300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on fans and accessories including fan curves with specified operating point clearly plotted, power, RPM, sound power levels at rated capacity, and electrical characteristics and connection requirements.
- C. Manufacturer's Instructions: Indicate installation instructions.
- D. Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.
- E. Maintenance Materials: Furnish the following for City and Borough of Juneau's use in maintenance of project.
  - 1. See Section 016000 - Product Requirements, for additional provisions.
  - 2. Extra Fan Belts: One set for each individual fan.

### **1.5 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

### **1.6 FIELD CONDITIONS**

- A. Permanent ventilators may not be used for ventilation during construction.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Greenheck: [www.greenheck.com](http://www.greenheck.com).
- B. Loren Cook Company: [www.lorencook.com](http://www.lorencook.com).
- C. PennBarry: [www.pennbarry.com](http://www.pennbarry.com).

### **2.2 ROOF EXHAUSTERS**

- A. Performance Ratings:
  - 1. See Sheet M001 for Performance Requirements.

- B. Fan Unit: V-belt or direct driven as indicated, with spun aluminum housing; resilient mounted

## **SECTION 233423 - HVAC POWER VENTILATORS**

motor; 1/2 inch mesh, 0.62 inch thick aluminum wire birdscreen; square base to suit roof curb with continuous curb gaskets.

- C. Roof Curb: 12 inch high self-flashing of galvanized steel with continuously welded seams, built-in cant strips.
- D. Disconnect Switch: Factory wired, non-fusible, weather proof, in housing for thermal overload protected motor.
- E. Backdraft Damper: Gravity actuated, aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked, and line voltage motor drive, power open, spring return.
- F. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheave selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Secure roof exhausters with cadmium plated steel lag screws to roof curb.
- C. Extend ducts to roof exhausters into roof curb. Counterflash duct to roof opening.
- D. Provide sheaves required for final air balance.
- E. Install backdraft dampers on inlet to roof exhauster, EF-36.

**END OF SECTION 233423**

## **SECTION 233600 - AIR TERMINAL UNITS**

### **PART 1 - GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Constant volume terminal units.
- B. Integral heating coils.
- C. Integral controls.

#### **1.2 RELATED REQUIREMENTS**

- A. Section 232113 - Hydronic Piping: Connections to heating coils.
- B. Section 232114 - Hydronic Specialties: Connections to heating coils.
- C. Section 233100 - HVAC Ducts and Casings.
- D. Section 233300 - Air Duct Accessories.
- E. Section 233700 - Air Outlets and Inlets.
- F. Section 230923 - Instrumentation and Control Devices for HVAC: Thermostats and Actuators.
- G. Section 262726 - Wiring Devices: Electrical characteristics and wiring connections.
- H. Drawings and General provisions of the Contract, including General, Supplementary Conditions, and all Division Specifications Section, apply to this section.

#### **1.3 REFERENCE STANDARDS**

- A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilation Systems; National Fire Protection Association; 2009.
- B. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; Underwriters Laboratories Inc.; 2005.

#### **1.4 SUBMITTALS**

- A. See Section 013300 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data indicating configuration, general assembly, and materials used in fabrication. Include catalog performance ratings that indicate air flow, static pressure, and NC designation. Include electrical characteristics and connection requirements.
- C. Shop Drawings: Indicate configuration, general assembly, and materials used in fabrication,

## **SECTION 233600 - AIR TERMINAL UNITS**

and electrical characteristics and connection requirements.

1. Include schedules listing discharge and radiated sound power level for each of second through sixth octave bands at inlet static pressures of 1 to 4 inch wg.
- D. Manufacturer's Installation Instructions: Indicate support and hanging details, and service clearances required.
- E. Project Record Documents: Record actual locations of units.
- F. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts lists. Include directions for resetting constant volume regulators.
- G. Warranty: Submit manufacturer warranty and ensure forms have been completed in City and Borough of Juneau's name and registered with manufacturer.
- H. Maintenance Materials: Furnish the following for City and Borough of Juneau's use in maintenance of project.
  1. See Section 016000 - Product Requirements, for additional provisions.
  2. Extra Motors: One of each type and size.

### **1.5 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.
- B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

### **1.6 WARRANTY**

- A. See Section 017700 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty for air terminal units.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURED UNITS**

- A. Ceiling mounted constant supply air control terminals for connection to single duct, central air systems, with system powered constant volume control, hot water heating coils.
- B. Identify each terminal unit with clearly marked identification label and air flow indicator. Include unit nominal air flow, maximum factory set airflow, minimum factory set air flow, and coil type.

## SECTION 233600 - AIR TERMINAL UNITS

### 2.2 SINGLE DUCT CONSTANT VOLUME UNITS

#### A. Basic Assembly:

1. Casings: Minimum 22 gage galvanized steel.
2. Lining: Minimum 1 inch thick neoprene or vinyl coated fibrous glass insulation, 1.5 lb/cu ft density, meeting NFPA 90A requirements and UL 181 erosion requirements. Face lining with mylar film.
3. Plenum Air Inlets: Round stub connections for duct attachment.
4. Plenum Air Outlets: S slip and drive connections.

#### B. Basic Unit:

1. Configuration: Air volume damper assembly inside unit casing. Locate control components inside protective metal shroud.
2. Volume Damper: Construct of galvanized steel with peripheral gasket and self lubricating bearings; maximum damper leakage: 2 percent of design air flow at 1 inches rated inlet static pressure.
3. Mount damper operator to position damper normally open.
4. Provide heating coil access door and sleeve, approximately 10 inches long. Sleeve shall be equipped with gasketed access door, upstream of coil to allow for coil inspection and cleaning.

#### C. Hot Water Heating Coil:

1. Construction: 1/2 inch copper tube mechanically expanded into aluminum plate fins, leak tested under water to 200 psig pressure, factory installed.
2. Capacity: Based on 195 degree F entering water, 165 degree F leaving water and 50 percent total air volume. See schedule on Sheet M002.

#### D. Digital Controls:

1. The terminal shall be equipped with pressure independent direct digital controls supplied by the Control CONTRACTOR and mounted by the Terminal Unit Manufacturer. Control CONTRACTOR shall provide data sheets on all components to be mounted, including components dimensions, mounting hardware, and methods, as well as wiring and piping diagrams for each application to the Terminal Unit Manufacturer.
2. Electronic Actuator: 24 volt with remote temperature read and reset capability.
3. Velocity Reset Controller and Probe:
  - a. Pneumatic inlet velocity sensors, supplied by the Terminal Unit Manufacturer. Sensor shall be multi point center averaging type, with minimum of four measuring ports parallel to the take off point from the sensor. Sensors with measuring points in series are not acceptable.
  - b. Calibration pressure taps for pressure independent control to compensate for varying inlet static pressure. Flow measuring taps for full measuring and setting of air volumes.
  - c. Minimum and maximum limits set at reset device.
  - d. Maintain airflow to within 5 percent of set point with inlet static pressure variations up to 4 inches.
  - e. Reset span, adjustable 3 to 8 psi shall remain constant regardless of minimum or maximum setting. Reset start point shall be adjustable from 3-10 psi.

## **SECTION 233600 - AIR TERMINAL UNITS**

- f. Terminal Manufacturer shall provide a Class II 24 VAC transformer and disconnect switch. Actuator shall be direct connection shaft mount type without linkage. Terminal Unit Manufacturer shall install controls in approved NEMA 1 sheet metal enclosure.
  - g. Coordinate requirements with Control CONTRACTOR for provision and mounting of controls. Controls shall be field set by Control CONTRACTOR for the scheduled minimum and maximum air volumes.
- F. Thermostat: Wall-mounted DDC electric type with appropriate mounting hardware. Refer to Section 230923.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Provide ceiling access doors or locate units above easily removable ceiling components.
- C. Support units individually from structure. Do not support from adjacent ductwork.
- D. Connect to ductwork in accordance with Section 233100.
- E. Provide minimum of 5 ft of 1 inch thick lined ductwork downstream of units.
- F. Verify that electric power is available and of the correct characteristics.

#### **3.2 ADJUSTING**

- A. Reset volume with damper operator attached to assembly allowing flow range modulation from 100 percent of design flow to 0 percent full flow. Set units with heating coils for minimum 50 percent full flow.

**END OF SECTION 233600**



## **SECTION 233700 - AIR OUTLETS AND INLETS**

### **PART 1 - GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Diffusers.
- B. Registers/grilles.
- C. Roof hoods.

#### **1.2 REFERENCE STANDARDS**

- A. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; Air Movement and Control Association International, Inc.; 2007.
- B. ARI 890 - Standard for Air Diffusers and Air Diffuser Assemblies; Air-Conditioning and Refrigeration Institute; 2001.
- C. ASHRAE Std 70 - Method of Testing for Rating the Performance of Air Outlets and Inlets; American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc.; 2006.
- D. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association; 2005.

#### **1.3 SUBMITTALS**

- A. See Section 013300 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.
- C. Project Record Documents: Record actual locations of air outlets and inlets.

#### **1.4 QUALITY ASSURANCE**

- A. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.
- B. Test and rate louver performance in accordance with AMCA 500-L.

#### **1.5 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

## **SECTION 233700 - AIR OUTLETS AND INLETS**

### **PART 2 - PRODUCTS**

#### **2.1 MANUFACTURERS**

- A. Carnes Company HVAC: [www.carnes.com](http://www.carnes.com).
- B. Krueger: [www.krueger-hvac.com](http://www.krueger-hvac.com).
- C. Price Industries: [www.price-hvac.com](http://www.price-hvac.com).
- D. Titus: [www.titus-hvac.com](http://www.titus-hvac.com).

#### **2.2 RECTANGULAR CEILING DIFFUSERS (CD-1)**

- A. Type: Square and rectangular, adjustable pattern, multi-louvered diffuser to discharge air in four way pattern.
- B. Frame: Inverted T-bar type.
- C. Fabrication: Steel with baked enamel finish.
- D. Color: As selected by ARCHITECT from manufacturer's standard range.

#### **2.3 PERFORATED FACE CEILING DIFFUSERS (CG-1)**

- A. Type: Perforated face with fully adjustable pattern and removable face.
- B. Frame: Inverted T-bar type.
- C. Fabrication: Steel with steel frame and baked enamel finish.
- D. Color: As selected by ARCHITECT from manufacturer's standard range.

#### **2.4 CEILING EXHAUST AND RETURN REGISTERS/GRILLES (WG-1)**

- A. Type: Streamlined blades, 3/4 inch minimum depth, 3/4 inch maximum spacing, with blades set at 35 degrees, vertical face.
- B. Frame: 1-1/4 inch margin with countersunk screw mounting.
- C. Fabrication: Steel with 20 gage minimum frames and 22 gage minimum blades, steel and aluminum with 20 gage minimum frame, or aluminum extrusions, with factory baked enamel finish.
- D. Color: To be selected by ARCHITECT from manufacturer's standard range.

## **SECTION 233700 - AIR OUTLETS AND INLETS**

### **2.6 WALL SUPPLY REGISTERS/GRILLES (WR-1)**

- A. Type: Streamlined and individually adjustable blades, 3/4 inch minimum depth, 3/4 inch maximum spacing with spring or other device to set blades, vertical face, single deflection.
- B. Frame: 1-1/4 inch margin with countersunk screw mounting and gasket.
- C. Fabrication: Steel with 20 gage minimum frames and 22 gage minimum blades, steel and aluminum with 20 gage minimum frame, or aluminum extrusions, with factory baked enamel finish.
- D. Color: To be selected by ARCHITECT from manufacturer's standard range.

### **2.7 ROOF HOODS**

- A. Fabricate air inlet or exhaust hoods in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
- B. Fabricate of galvanized steel, minimum 16 gage base and 20 gage hood, or aluminum, minimum 16 gage base and 18 gage hood; suitably reinforced; with removable hood; birdscreen with 1/2 inch square mesh for exhaust and 3/4 inch for intake, and factory prime coat finish. Anti-condensate insulation on hood.
- C. Mount unit on minimum 12 inch high curb base with insulation between duct and curb.
- D. Make hood outlet area minimum of twice throat area.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.
- C. Install diffusers to ductwork with air tight connection.
- D. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.
- E. Paint ductwork visible behind air outlets and inlets matte black. Refer to Section 099123.

**END OF SECTION 233700**

## **SECTION 238101 - TERMINAL HEAT TRANSFER UNITS**

### **PART 1 - GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Finned tube radiation.
- B. Fan-coil units.
- C. Radiant heaters.

#### **1.2 RELATED REQUIREMENTS**

- A. Section 232113 - Hydronic Piping.
- B. Section 232114 - Hydronic Specialties.
- C. Section 230993 - Sequence of Operations for HVAC Controls.
- D. Section 262726 – Wiring Devices: Electrical characteristics and wiring connections. Installation of room thermostats. Electrical supply to units.
- E. Drawings and General provisions of the Contract, including General, Supplementary Conditions, and all Division Specifications Section, apply to this section.

#### **1.3 SUBMITTALS**

- A. See Section 013300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide typical catalog of information including arrangements.
- C. Shop Drawings:
  - 1. Indicate cross sections of cabinets, grilles, bracing and reinforcing, and typical elevations.
  - 2. Submit schedules of equipment and enclosures typically indicating length and number of pieces of element and enclosure, corner pieces, end caps, cap strips, access doors, pilaster covers, and comparison of specified heat required to actual heat output provided.
  - 3. Indicate mechanical and electrical service locations and requirements.,
- D. Manufacturer's Instructions: Indicate installation instructions and recommendations.
- E. Project Record Documents: Record actual locations of components and locations of access doors in radiation cabinets required for access or valving.
- F. Operation and Maintenance Data: Include manufacturers' descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listings.

## **SECTION 238101 - TERMINAL HEAT TRANSFER UNITS**

- G. Warranty: Submit manufacturer's warranty and ensure forms have been completed in City and Borough of Juneau's name and registered with manufacturer.
- H. Maintenance Materials: Furnish the following for City and Borough of Juneau's use in maintenance of project.
  - 1. See Section 016000 - Product Requirements, for additional provisions.
  - 2. Extra Filters: One set of each type and size.

### **1.4 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

### **1.5 WARRANTY**

- A. See Section 017700 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer's warranty for fan-coil unit.

## **PART 2 - PRODUCTS**

### **2.1 FINNED TUBE RADIATION**

- A. Manufacturers:
  - 1. Slant/Fin Corporation: [www.slantfin.com](http://www.slantfin.com).
  - 2. Marley Engineered Products: [www.marleymeh.com](http://www.marleymeh.com).
  - 3. Trane Inc: [www.trane.com](http://www.trane.com).
  - 4. Vulcan
  - 5. Airtherm
  - 6. Sterling
- B. Heating Elements: 1 inch ID seamless copper tubing, mechanically expanded into evenly spaced aluminum fins sized 4 1/4 x 4 1/4 inches, suitable for soldered fittings.
- C. Element Hangers: Quiet operating, ball bearing cradle type providing unrestricted longitudinal movement, on enclosure brackets.
- D. Enclosures: Sloping top. 0.0478 inch steel up to 18 inches in height, 0.0598 inch steel over 18 inches in height or aluminum as detailed, with easily jointed components for wall to wall installation.

## SECTION 238101 - TERMINAL HEAT TRANSFER UNITS

1. Support rigidly, on wall or floor mounted brackets.
  2. Support rigidly, on wall or floor mounted brackets at least 3 feet on center maximum.
- E. Finish: Factory applied baked enamel of color as selected.
- F. Damper: Where not thermostatically controlled, provide knob-operated internal damper at enclosure air outlet.
- G. Access Doors: For otherwise inaccessible valves, provide factory-made permanently hinged access doors, 6 x 7 inch minimum size, integral with cabinet.
- H. Capacity: As scheduled, based on 65 degree F entering air temperature, 180 degree F average water temperature.

### 2.2 FAN-COIL UNITS

A. Manufacturers:

1. Carrier Corporation: [www.carrier.com](http://www.carrier.com).
2. McQuay International: [www.mcquay.com](http://www.mcquay.com).
3. Trane Inc: [www.trane.com](http://www.trane.com).

- B. Coils: Evenly spaced aluminum fins mechanically bonded to copper tubes, designed for 200 psi and 220 degrees F. Provide drain pan under cooling coil, easily removable for cleaning, with drain connection.

C. WATER COOLING COILS

1. Tubes: 5/8 inch OD seamless copper or brass arranged in parallel or staggered pattern, expanded into fins, silver brazed joints.
2. Fins: Aluminum or copper continuous plate type with full fin collars. Solder coat copper fin coils.
3. Casing: Die formed channel frame of 16 gage galvanized steel with 3/8 inch mounting holes on 3 inch centers. Provide tube supports for coils longer than 36 inches.
4. Headers: Cast iron with tubes expanded into header.
5. Testing: Air test under water to 200 psi for working pressure of 200 psi and 220 degrees F.
6. Configuration: Drainable, with threaded plugs in headers for drain and vent; threaded plugs in return bends and in headers opposite each tube.
7. Fin Spacing: 8 fins per inch.

D. WATER HEATING COILS

1. Tubes: 5/8 inch OD seamless copper or brass arranged in parallel or staggered pattern, expanded into fins, silver brazed joints.
2. Fins: Aluminum or copper continuous plate type with full fin collars.
3. Casing: Die formed channel frame of 16 gage galvanized steel with mounting holes on 3 inch centers. Provide tube supports for coils longer than 36 inches.
4. Headers: Cast iron with tubes expanded into header.
5. Testing: Air test under water to 200 psi for working pressure of 200 psi and 220 degrees F.

## SECTION 238101 - TERMINAL HEAT TRANSFER UNITS

6. Configuration: Drainable, with threaded plugs for drain and vent.
7. Fin Spacing: 8 fins per inch.
- E. Cabinet: 0.0598 inch steel with exposed corners and edges rounded, easily removed panels, glass fiber insulation and integral air outlet.
- F. Finish: Factory apply baked enamel of color as selected on visible surfaces of enclosure or cabinet.
- G. Fans: Centrifugal forward-curved double-width wheels, statically and dynamically balanced, direct driven.
- H. Motor: Tap wound multiple speed permanent split capacitor with sleeve bearings, resiliently mounted.
- I. Control: Multiple speed switch, factory wired, located in cabinet.
- J. Filter: Easily removed 1 inch thick glass fiber throw-away type, located to filter air before coil.
- K. Mixing Dampers: Where indicated, mixing sections with dampers. Refer to Section 23 0993 for operating sequence.
- L. Capacity: As Scheduled, based on 65 degrees F entering air temperature, 180 degree F average water temperature.
- M.. Electrical Characteristics:
  1. See Sheet M001 for Performance Requirements.

### 2.3 HYDRONIC RADIANT CEILING PANELS

- A. Manufacturers:
  1. Hydro-Air Components, Inc: [www.rittling.com](http://www.rittling.com).
  2. TWA Panel Systems, Inc.: [www.twapanel.com](http://www.twapanel.com).
  3. Air Tex.
  4. Sun Tile.
- B. Ceiling Panels: Constructed of modular 24 by 48 inch aluminum pans with silkscreened pattern matching ceiling tile.
  1. Pipe Coil: Incorporate continuous 1/2 inch copper pipe thermally bonded. Provide return bends for two water connections to each panel.
  2. Insulate with 1 inch thick fiberglass insulation. Configure panels within T-bar ceiling module.
- C. Heating Capacity: As scheduled, based on 180 degrees F average water temperature, 70 degrees F space temperature.

## **SECTION 238101 - TERMINAL HEAT TRANSFER UNITS**

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install equipment exposed to finished areas after walls and ceiling are finished and painted. Do not damage equipment or finishes.
- C. Protection: Provide finished cabinet units with protective covers during balance of construction.
- D. Baseboard Radiation: Locate on outside walls and run cover continuously wall-to-wall unless otherwise indicated. Center elements under windows. Install end caps where units butt against walls.
- E. Finned Tube Radiation: Locate on outside walls and run cover wall-to-wall unless otherwise indicated. Center elements under windows. Align cabinet joints with window mullions. Install wall angles where units butt against walls.
- F. Fan-Coil Units: Install as indicated. Coordinate to assure correct recess size for recessed units.
- G. Hydronic Units: Provide with shut-off valve on supply and lockshield balancing valve on return piping. If not easily accessible, extend vent to exterior surface of cabinet for easy servicing. For cabinet unit heaters, fan coil units, and unit heaters, provide float operated automatic air vents with stop valve.
- H. Units with Cooling Coils: Connect drain pan to condensate drain.
- I. Install heating and cooling coil in casings in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
  - 1. Support coil sections independent of piping on steel channel or double angle frames and secure to casings.
  - 2. Provide frames for maximum three coil sections.
  - 3. Arrange supports to avoid piercing drain pans.
  - 4. Provide airtight seal between coil and duct or casing.
  - 5. Refer to Section 233100.
- J. Protect coils to prevent damage to fins and flanges. Comb out bent fins.
- K. Install coils level. Install cleanable tube coils with 1:50 pitch.
- L. Make connections to coils with unions and flanges.
- M. Hydronic Coils:
  - 1. Hydronic Coils: Connect water supply to leaving air side of coil (counterflow arrangement).
  - 2. Provide shut-off valve on supply line and lockshield balancing valve with memory stop on



## **SECTION 238101 - TERMINAL HEAT TRANSFER UNITS**

return line.

3. Provide float operated automatic air vents at high points complete with stop valve.
4. Ensure water coils are drainable and provide drain connection at low points.

### **N. Cooling Coils:**

1. Provide three break moisture eliminators of 24 gage galvanized steel, where air velocity exceeds 500 ft/min.
2. Provide drain pan and drain connection; fabricate from 20 gage galvanized steel, extend 3 inches from face of entering air side, 6 inches from face of leaving air side, and 4 inches from face of eliminators. Pipe drain pans individually to floor drain with water seal trap.

- O. All radiant panels shall be installed by personnel wearing white gloves, to avoid soiling of panel face. Hangers for safety and seismic restraint shall be installed 4 feet on center and as recommended by manufacturer. All panels shall be covered with a minimum of 2 inch thick fiberglass blanket with vapor proof covering.

## **3.2 CLEANING**

- A. After construction is completed, including painting, clean exposed surfaces of units. Vacuum clean coils and inside of cabinets.
- B. Touch-up marred or scratched surfaces of factory-finished cabinets, using finish materials furnished by manufacturer.
- C. Install new filters.

**END OF SECTION 238101**

## **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. This Section includes the following:
  - 1. Building wires and cables rated 600 V and less.
  - 2. Connectors, splices, and terminations rated 600 V and less.
- B. Related Sections include the following:
  - 1. Division 27 Section "Communications Horizontal Cabling" for cabling used for voice and data circuits.
  - 2. Division 28 Section "Conductors and Cables for Electronic Safety and Security" for cabling used for Building Automation System, nurse call, access controls, and fire alarm.

#### **1.3 DEFINITIONS**

- A. EPDM: Ethylene-propylene-diene terpolymer rubber.
- B. NBR: Acrylonitrile-butadiene rubber.

#### **1.4 ACTION SUBMITTALS**

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

#### **1.5 INFORMATIONAL SUBMITTALS**

- A. Field quality-control test reports.

#### **1.6 QUALITY ASSURANCE**

- A. 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.
- B. Comply with NFPA 70.

## **SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES**

### **PART 2 - PRODUCTS**

#### **2.1 CONDUCTORS AND CABLES**

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Alcan Products Corporation; Alcan Cable Division.
  - 2. American Insulated Wire Corp.; a Leviton Company.
  - 3. General Cable Corporation.
  - 4. Senator Wire & Cable Company.
  - 5. Southwire Company.
- B. Copper Conductors: Comply with NEMA WC 70.
- C. Conductor Insulation: Comply with NEMA WC 70 for Types THW, THHN-THWN, XHHW, and SO.
- D. Multiconductor Cable: Comply with NEMA WC 70 for metal-clad cable, Type MC.

#### **2.2 CONNECTORS AND SPLICES**

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. AFC Cable Systems, Inc.
  - 2. Hubbell Power Systems, Inc.
  - 3. O-Z/Gedney; EGS Electrical Group LLC.
  - 4. 3M; Electrical Products Division.
  - 5. Tyco Electronics Corp.
- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

### **PART 3 - EXECUTION**

#### **3.1 CONDUCTOR MATERIAL APPLICATIONS**

- A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

## **SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES**

### **3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS**

- A. Exposed Feeders: Type THHN-THWN, single conductors in raceway.
- B. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN-THWN, single conductors in raceway.
- C. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.
- D. Cord Drops and Portable Appliance Connections: Type MC or Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.
- E. Class 1 Control Circuits: Type THHN-THWN, in raceway.
- F. Class 2 Control Circuits: Type THHN-THWN, in raceway..

### **3.3 INSTALLATION OF CONDUCTORS AND CABLES**

- A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.
- B. 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.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- E. Support cables according to Division 26 Section "Hangers and Supports for Electrical Systems."
- F. Identify and color-code conductors and cables according to Division 26 Section "Identification 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 and UL 486B.
- B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
  - 1. Use oxide inhibitor in each splice and tap conductor for conductors in a wet or damp environment.

## **SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES**

- C. Wiring at Outlets: Install conductor at each outlet, with at least **6 inches (150 mm)** of slack.

### **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 Division 26 Section "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

### **3.6 FIRESTOPPING**

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Division 07 Section "Penetration Firestopping."

### **3.7 FIELD QUALITY CONTROL**

- A. Perform tests and inspections and prepare test reports.
- B. 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. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in cables and conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner.
    - 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 splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.
- C. Test Reports: Prepare a written report to record the following:
  - 1. Test procedures used.
  - 2. Test results that comply with requirements.
  - 3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
- D. Remove and replace malfunctioning units and retest as specified above.

**END OF SECTION 260519**

## **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 systems and equipment.

#### **1.3 ACTION SUBMITTALS**

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

#### **1.4 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. Comply with UL 467 for grounding and bonding materials and equipment.

### **PART 2 - PRODUCTS**

#### **2.1 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 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 wide and 1/16 inch thick.
  - 7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

## **SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS**

### **2.2 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, pressure type with at least two bolts.
  - 1. Pipe Connectors: Clamp type, sized for pipe.
- 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.

## **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. 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.
- C. Conductor Terminations and Connections:
  - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
  - 2. Connections to Structural Steel: Welded connectors.

### **3.2 EQUIPMENT GROUNDING**

- A. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
  - 1. Feeders and branch circuits.
  - 2. Receptacle circuits.
  - 3. Single-phase motor and appliance branch circuits.
  - 4. Three-phase motor and appliance branch circuits.
  - 5. Flexible raceway runs.
  - 6. Metal-clad cable runs.
  - 7. Computer and Rack-Mounted Electronic Equipment Circuits: Install insulated equipment grounding conductor in branch-circuit runs from equipment-area power panels and power-distribution units.

## **SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS**

- 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. 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.
- D. 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.

### **3.3 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. 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.
- C. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned bonding jumper to bond across flexible duct connections to achieve continuity.

### **3.4 LABELING**

- A. Comply with requirements in Division 26 Section "Identification for Electrical Systems" Article for instruction signs. The label or its text shall be green.

### **3.5 FIELD QUALITY CONTROL**

- A. Perform tests and inspections.
- B. Tests and Inspections:



## **SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS**

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.
- C. Grounding system will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

**END OF SECTION 260526**

## **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. This Section includes the following:
  - 1. Hangers and supports for electrical equipment and systems.
  - 2. Construction requirements for concrete bases.
- B. Related Sections include the following:
  - 1. Division 26 Section "Vibration and Seismic Controls for Electrical Systems" for products and installation requirements necessary for compliance with seismic criteria.

#### **1.3 DEFINITIONS**

- A. EMT: Electrical metallic tubing.
- B. IMC: Intermediate metal conduit.
- C. RMC: Rigid metal conduit.

#### **1.4 PERFORMANCE REQUIREMENTS**

- A. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
- B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
- C. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

#### **1.5 ACTION SUBMITTALS**

- A. Product Data: For the following:
  - 1. Steel slotted support systems.

## **SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS**

### **1.6 QUALITY ASSURANCE**

- A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Comply with NFPA 70.

## **PART 2 - PRODUCTS**

### **2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS**

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Allied Tube & Conduit.
    - b. Cooper B-Line, Inc.; a division of Cooper Industries.
    - c. ERICO International Corporation.
    - d. GS Metals Corp.
    - e. Thomas & Betts Corporation.
    - f. Unistrut; Tyco International, Ltd.
    - g. Wesanco, Inc.
  - 2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
  - 3. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
  - 4. Channel Dimensions: Selected for applicable load criteria.
- B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- 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. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- E. 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. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1) Hilti Inc.
  - 2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
  - 3) MKT Fastening, LLC.
  - 4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.
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 in which used.
  - a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - 1) Cooper B-Line, Inc.; a division of Cooper Industries.
    - 2) Empire Tool and Manufacturing Co., Inc.
    - 3) Hilti Inc.
    - 4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
    - 5) MKT Fastening, LLC.
3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type 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.

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Division 05 Section "Metal Fabrications" for steel shapes and plates.

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

## **SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS**

- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.
- C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
  - 1. Secure raceways and cables to these supports with single-bolt conduit clamps.
- D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

### **3.2 SUPPORT INSTALLATION**

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in 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.
- 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 thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
  - 6. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts or Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
  - 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 meet seismic-restraint strength and anchorage requirements.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

## **SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS**

### **3.3 INSTALLATION OF FABRICATED METAL SUPPORTS**

- A. Comply with installation requirements in Division 05 Section "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 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.
- B. Comply with requirements in Division 09 painting Sections 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**

## **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. Metal wireways and auxiliary gutters.
  - 3. Surface raceways.
  - 4. Boxes, enclosures, and cabinets.
- B. Related Requirements:

#### **1.3 DEFINITIONS**

- A. GRC: Galvanized rigid steel conduit.
- B. IMC: Intermediate metal conduit.

#### **1.4 ACTION SUBMITTALS**

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

#### **1.5 INFORMATIONAL SUBMITTALS**

- A. Source quality-control reports.

### **PART 2 - PRODUCTS**

#### **2.1 METAL CONDUITS, TUBING, AND 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. AFC Cable Systems, Inc.
  - 2. Allied Tube & Conduit; a Tyco International Ltd. Co.
  - 3. Anamet Electrical, Inc.

## **SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS**

4. Electri-Flex Company.
  5. O-Z/Gedney; a brand of EGS Electrical Group.
  6. Picoma Industries, a subsidiary of Mueller Water Products, Inc.
  7. Republic Conduit.
  8. Robroy Industries.
  9. Southwire Company.
  10. Thomas & Betts Corporation.
  11. Western Tube and Conduit Corporation.
  12. Wheatland Tube Company; a division of John Maneely 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. EMT: Comply with ANSI C80.3 and UL 797.
- F. FMC: Comply with UL 1; zinc-coated steel.
- G. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.
- H. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
1. Fittings for EMT:
    - a. Material: Steel.
    - b. Type: Setscrew or compression.
  2. Expansion Fittings: Steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
- I. 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, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. AFC Cable Systems, Inc.
  2. Anamet Electrical, Inc.
  3. Arnco Corporation.
  4. CANTEX Inc.
  5. CertainTeed Corp.
  6. Condux International, Inc.
  7. Electri-Flex Company.



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8. Kraloy.
  9. Lamson & Sessions; Carlon Electrical Products.
  10. Niedax-Kleinhuis USA, Inc.
  11. RACO; a Hubbell company.
  12. Thomas & Betts Corporation.
- 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. LFNC: Comply with UL 1660.
- D. Fittings for LFNC: Comply with UL 514B.

### **2.3 METAL WIREWAYS AND AUXILIARY GUTTERS**

- 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. Cooper B-Line, Inc.
  2. Hoffman; a Pentair company.
  3. Mono-Systems, Inc.
  4. Square D; a brand of Schneider Electric.
- B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 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: Screw-cover type unless otherwise indicated.
- E. Finish: Manufacturer's standard enamel finish.

### **2.4 SURFACE RACEWAYS**

- A. Listing and Labeling: Surface raceways 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. Prime coated, ready for field painting.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

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- a. Mono-Systems, Inc.
- b. Panduit Corp.
- c. Wiremold / Legrand.

### 2.5 BOXES, ENCLOSURES, AND CABINETS

- 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. Adalet.
  - 2. Cooper Technologies Company; Cooper Crouse-Hinds.
  - 3. EGS/Appleton Electric.
  - 4. Erickson Electrical Equipment Company.
  - 5. FSR Inc.
  - 6. Hoffman; a Pentair company.
  - 7. Hubbell Incorporated; Killark Division.
  - 8. Kraloy.
  - 9. Milbank Manufacturing Co.
  - 10. Mono-Systems, Inc.
  - 11. O-Z/Gedney; a brand of EGS Electrical Group.
  - 12. RACO; a Hubbell Company.
  - 13. Robroy Industries.
  - 14. Spring City Electrical Manufacturing Company.
  - 15. Stahlin Non-Metallic Enclosures; a division of Robroy Industries.
  - 16. Thomas & Betts Corporation.
  - 17. 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. Metal Floor Boxes:
  - 1. Material: Cast metal or sheet metal.
  - 2. Type: fully adjustable with recessed devices.
  - 3. Shape: Rectangular.
  - 4. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- 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.

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- 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 by 2-1/8 inches by 2-1/8 inches deep (100 mm by 60 mm 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. 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.

## PART 3 - EXECUTION

### 3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
  - 1. Exposed Conduit: GRC or IMC.
  - 2. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFNC.
  - 3. Boxes and Enclosures, Aboveground: NEMA 250, Type 4.
- 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. Concealed in Ceilings and Interior Walls and Partitions: EMT.
  - 4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
  - 5. Boxes and Enclosures: NEMA 250, Type 1.
- C. Minimum Raceway Size: 1/2-inch (16-mm) trade size.

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- 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. EMT: Use setscrew or compression, steel fittings. Comply with NEMA FB 2.10.
  - 3. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.
- E. Install surface raceways only where indicated on Drawings.

### 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 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 Division 26 Section "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. Stub-ups to Above Recessed Ceilings:
  - 1. Use EMT for raceways.
  - 2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
- J. 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.
- K. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
- L. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to **1-1/4-inch (35mm)** trade size and insulated

## SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

throat metal bushings on 1-1/2-inch (41-mm) trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

- 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.
- 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 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 otherwise required by NFPA 70.
- S. Expansion-Joint Fittings:
  - 1. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
  - 2. 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.
- T. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches (1830 mm) of flexible conduit for recessed and semi-recessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
  - 1. Use LFNC in damp or wet locations.
- U. 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.
- V. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

## **SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS**

- W. Locate boxes so that cover or plate will not span different building finishes.
- X. 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.
- Y. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.
- Z. Set metal floor boxes level and flush with finished floor surface.

### **3.3 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 Division 26 Section "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

### **3.4 FIRESTOPPING**

- A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Division 07 Section "Penetration Firestopping."

### **3.5 PROTECTION**

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
  - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

**END OF SECTION 260533**

## **SECTION 260536 - CABLE TRAYS 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. This Section includes steel basket trays and aluminum cable trays and accessories.
- B. Wire basket support systems are defined to include, but are not limited to straight sections of continuous wire mesh, field formed horizontal and vertical bends, tees, drop outs, supports and accessories.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: Include data indicating dimensions and finishes for each type of cable tray indicated.
- B. Shop Drawings: For each type of cable tray.
  - 1. Show fabrication and installation details of tray, including plans, elevations, and sections of components and attachments to other construction elements. Designate components and accessories, including clamps, brackets, hanger rods, splice-plate connectors, expansion-joint assemblies, straight lengths, and fittings.

#### **1.4 INFORMATIONAL SUBMITTALS**

- A. Coordination Drawings: Floor plans and sections, drawn to scale. Include scaled tray layout and relationships between components and adjacent structural, electrical, and mechanical elements. Show the following:
  - 1. Vertical and horizontal offsets and transitions.
  - 2. Clearances for access above and to side of cable trays.
  - 3. Vertical elevation of trays above the floor or bottom of ceiling structure.
- B. Field quality-control reports.

#### **1.5 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: For trays to include in emergency, operation, and maintenance manuals.

## **SECTION 260536 - CABLE TRAYS FOR ELECTRICAL SYSTEMS**

### **1.6 QUALITY ASSURANCE**

- A. Source Limitations: Obtain tray components through one source from a single manufacturer.
- 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 NFPA 70.

### **1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Store indoors to prevent water or other foreign materials from staining or adhering to cable tray. Unpack and dry wet materials before storage.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Chalfant Manufacturing Company.
  - 2. Cooper B-Line, Inc.
  - 3. Cope, T. J., Inc.; a subsidiary of Allied Tube & Conduit.
  - 4. GS Metals Corp.; GLOBETRAYS Products.
  - 5. MONO-SYSTEMS, Inc.
  - 6. MPHusky.
  - 7. PW Industries.

### **2.2 MATERIALS AND FINISHES**

- A. Cable Trays, Fittings, and Accessories: Aluminum, complying with NEMA VE 1, Aluminum Association's Alloy 6063-T6 for rails, rungs, and cable trays, and Alloy 5052-H32 or Alloy 6061-T6 for fabricated parts; with chromium-zinc, ASTM F 1136, splice-plate fasteners, bolts, and screws.
- B. Wire Basket: Types and sizes indicated; with connector assemblies, clamp assemblies, connector plates, splice plates and splice bars. Construct units with rounded edges and smooth surfaces; in compliance with applicable standards; and with the following additional construction features. Material and finish specifications for Pre-Galvanized Steel Wire are as follows:
  - 1. Electro-Plated Zinc Galvanizing: Straight sections shall be made from steel meeting the minimum mechanical properties of ASTM A 510, Grade 1008 and shall be electro-plated zinc in accordance with ASTM B633, Type III, SC-1.



## **SECTION 260536 - CABLE TRAYS FOR ELECTRICAL SYSTEMS**

2. All straight section longitudinal wires shall be constructed with a continuous top wire safety edge. Safety edge must be kinked and T-welded on all tray sizes.
  3. Wire basket shall be made of high strength steel wires and formed into a standard 2 inch by 4 inch wire mesh pattern with intersecting wires welded together. All mesh sections must have at least one bottom longitudinal wire along entire length of straight section.
  4. Wire basket shall have a 2 inch usable loading depth.
  5. Wire basket supports shall be center support hangers, trapeze hangers or wall brackets.
- C. Sizes and Configurations: Refer to the Drawings for specific requirements for types, materials, sizes, and configurations.

### **2.3 TRAY ACCESSORIES**

- A. Fittings: Tees, crosses, risers, elbows, and other fittings as indicated, of same materials and finishes as tray.
- B. Tray supports and connectors, including bonding jumpers, as recommended by tray manufacturer.

### **2.4 SOURCE QUALITY CONTROL**

- A. Perform design and production tests according to NEMA VE 1.

## **PART 3 - EXECUTION**

### **3.1 TRAY INSTALLATION**

- A. Comply with recommendations in NEMA VE 2. Install as a complete system, including all necessary fasteners, hold-down clips, splice-plate support systems, hinged horizontal and vertical splice plates, elbows, reducers, tees, and crosses.
- B. Provide structural characteristics and support for a symmetrical load of 50 pounds per linear foot for cable tray and 25 pounds per linear foot for basket tray, unless otherwise noted.
- C. Remove burrs and sharp edges from trays.
- D. Fasten tray supports to building structure and install seismic restraints.
  1. Design each fastener and support to carry load indicated by seismic requirements and to comply with seismic-restraint details according to Division 26 Section "Vibration and Seismic Controls for Electrical Systems."
  2. Place supports so that spans do not exceed maximum allowances.

## **SECTION 260536 - CABLE TRAYS FOR ELECTRICAL SYSTEMS**

3. Construct supports from channel members, threaded rods, and other appurtenances furnished by cable tray manufacturer. Arrange supports in trapeze or wall-bracket form as required by application.
  4. Support bus assembly to prevent twisting from eccentric loading.
  5. Manufacture center-hung support, designed for 60 percent versus 40 percent eccentric loading condition, with a safety factor of 3.
  6. Locate and install supports according to NEMA VE 1.
- E. Make changes in direction and elevation using standard fittings.
- F. Make tray connections using standard fittings.
- G. Seal penetrations through fire and smoke barriers according to Division 07 Section "Penetration Firestopping."
- H. Sleeves for Future Cables: Install capped sleeves for future cables through firestop-sealed cable tray penetrations of fire and smoke barriers.
- I. Workspace: Install trays with enough space to permit access for installing cables. Provide a minimum of six inches on the sides and four inches above.

### **3.2 CABLE INSTALLATION**

- A. Install cables only when tray installation has been completed and inspected.
- B. Fasten cables on horizontal runs with cable clamps or cable ties as recommended by NEMA VE 2. Tighten clamps only enough to secure the cable, without indenting the cable jacket. Install cable ties with a tool that includes an automatic pressure-limiting device.
- C. On vertical runs, fasten cables to tray every 18 inches. Install intermediate supports when cable weight exceeds the load-carrying capacity of the tray rungs.
- D. In existing construction, remove inactive or dead cables from tray.
- E. Install covers after installation of cable is completed.

### **3.3 CONNECTIONS**

- A. Ground trays according to manufacturer's written instructions.
- B. Install an equipment grounding conductor with tray, in addition to those required by NFPA 70.

### **3.4 FIELD QUALITY CONTROL**

- A. After installing trays and after electrical circuitry has been energized, survey for compliance with requirements. Perform the following field quality-control survey:

## **SECTION 260536 - CABLE TRAYS FOR ELECTRICAL SYSTEMS**

1. Visually inspect cable insulation for damage. Correct sharp corners, protuberances in cable tray, vibration, and thermal expansion and contraction conditions, which may cause or have caused damage.
2. Verify that the number, size, and voltage of cables in cable tray do not exceed that permitted by NFPA 70. Verify that communication or data-processing circuits are separated from power circuits by barriers.
3. Verify that there is no intrusion of such items as pipe, hangers, or other equipment that could damage cables.
4. Remove deposits of dust, industrial process materials, trash of any description, and any blockage of tray ventilation.
5. Visually inspect each cable tray joint and each ground connection for mechanical continuity. Check bolted connections between sections for corrosion. Clean and retorqued in suspect areas.
6. Check for missing or damaged bolts, bolt heads, or nuts. When found, replace with specified hardware.
7. Perform visual and mechanical checks for adequacy of cable tray grounding; verify that all takeoff raceways are bonded to cable tray.

B. Report results in writing.

### **3.5 PROTECTION**

A. Protect installed cable trays.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by tray manufacturer.
2. Install temporary protection for cables in open trays to protect exposed cables from falling objects or debris during construction. Temporary protection for cables and cable tray can be constructed of wood or metal materials until the risk of damage is over.

**END OF SECTION 260536**

## **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. Division 07 Section "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 minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

- C. Sleeves for Rectangular Openings:

- 1. Material: Galvanized sheet steel.

## **SECTION 260544 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING**

### **2. Minimum Metal Thickness:**

- a. For sleeve cross-section rectangle perimeter less than 50 inches and with no side larger than 16 inches, thickness shall be 0.052 inch.
- b. For sleeve cross-section rectangle perimeter 50 inches or more and one or more sides larger than 16 inches, thickness shall be 0.138 inch.

### **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, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, 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 or Nitrile (Buna N) 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 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, 28-day compressive strength.
- D. **Packaging:** Premixed and factory packaged.

### **2.4 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.

## **SECTION 260544 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING**

- B. Silicone Foams: Multi-component, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, non-shrinking 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 Division 07 Section "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 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 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.

## **SECTION 260544 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING**

### **3.2 SLEEVE-SEAL-SYSTEM INSTALLATION**

- A. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

**END OF SECTION 260544**

## **SECTION 260548 - VIBRATION AND 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. This Section includes the following:
  - 1. Channel support systems.
  - 2. Restraint cables.
  - 3. Hanger rod stiffeners.
  - 4. Anchorage bushings and washers.
- B. Related Sections include the following:
  - 1. Division 26 Section "Hangers and Supports for Electrical Systems" for commonly used electrical supports and installation requirements.

#### **1.3 DEFINITIONS**

- A. The IBC: International Building Code.
- B. ICC-ES: ICC-Evaluation Service.

#### **1.4 PERFORMANCE REQUIREMENTS**

- A. Seismic-Restraint Loading:
  - 1. Site Class as Defined in the IBC: C.
  - 2. Assigned Seismic Use Group or Building Category as Defined in the IBC: II.

#### **1.5 ACTION SUBMITTALS**

- A. Product Data: For the following:
  - 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.
    - b. Annotate to indicate application of each product submitted and compliance with requirements.



## **SECTION 260548 - VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS**

2. Restrained-Isolation Devices: Include ratings for horizontal, vertical, and combined loads.

### **1.6 INFORMATIONAL SUBMITTALS**

- A. Field quality-control test reports.

### **1.7 QUALITY ASSURANCE**

- A. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.
- B. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- C. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. 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.
- D. Comply with NFPA 70.

## **PART 2 - PRODUCTS**

### **2.1 SEISMIC-RESTRAINT DEVICES**

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  1. Amber/Booth Company, Inc.
  2. California Dynamics Corporation.
  3. Cooper B-Line, Inc.; a division of Cooper Industries.
  4. Hilti Inc.
  5. Loos & Co.; Seismic Earthquake Division.
  6. Mason Industries.
  7. TOLCO Incorporated; a brand of NIBCO INC.
  8. Unistrut; Tyco International, Ltd.
- B. General Requirements for Restraint Components: Rated strengths, features, and application requirements shall be as defined in reports by an evaluation service member of ICC-ES.
  1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.

## **SECTION 260548 - VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS**

- C. Channel Support System: MFMA-3, shop- or field-fabricated support assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; and rated in tension, compression, and torsion forces.
- D. Restraint Cables: ASTM A 603 galvanized-steel cables with end connections made of steel assemblies with thimbles, brackets, swivels, and bolts designed for restraining cable service; and with a minimum of two clamping bolts for cable engagement.
- E. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod. Do not weld stiffeners to rods.
- F. Mechanical Anchor: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchors with strength required for anchor and as tested according to ASTM E 488. Minimum length of eight times diameter.
- G. Adhesive Anchor: Drilled-in and capsule anchor system containing polyvinyl 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.

### **2.2 FACTORY FINISHES**

- A. Finish: Manufacturer's standard prime-coat finish ready for field painting.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine areas and equipment to receive seismic-control devices for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Examine roughing-in of 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.
- B. Hanger Rod Stiffeners: Install hanger rod stiffeners where required to prevent buckling of hanger rods due to seismic forces.

## **SECTION 260548 - VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS**

- 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. Equipment and Hanger Restraints:
  - 1. Install restrained isolators on electrical equipment.
  - 2. Install resilient, bolt-isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
- B. 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.
- C. 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, wireways, and trays where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where they terminate with connection 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. Perform tests and inspections.
- B. Tests and Inspections:

## **SECTION 260548 - VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS**

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 postconnection testing has been approved), and with at least seven days' advance notice.
3. Obtain Architect'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 Architect.
5. Test to 90 percent of rated proof load of device.
6. Measure isolator restraint clearance.
7. Measure isolator deflection.
8. Verify snubber minimum clearances.
9. If a device fails test, modify all installations of same type and retest until satisfactory results are achieved.

C. Remove and replace malfunctioning units and retest as specified above.

D. Prepare test and inspection reports.

### **3.6 ADJUSTING**

- A. Adjust isolators after isolated equipment is at operating weight.
- B. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.
- C. Adjust active height of spring isolators.
- D. Adjust restraints to permit free movement of equipment within normal mode of operation.

**END OF SECTION 260548**

## **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. Equipment identification labels.
  - 2. Miscellaneous identification products.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each electrical identification product indicated.

#### **1.4 QUALITY ASSURANCE**

- A. Comply with ANSI A13.1.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

#### **1.5 COORDINATION**

- A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.
- B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- C. Coordinate installation of identifying devices with location of access panels and doors.
- D. Install identifying devices before installing acoustical ceilings and similar concealment.

## **SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS**

### **PART 2 - PRODUCTS**

#### **2.1 CONDUCTOR IDENTIFICATION MATERIALS**

- A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.
- B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
- C. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
- D. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
- E. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.
- F. Write-On Tags: Polyester tag, 0.010 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
  - 1. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

#### **2.2 EQUIPMENT IDENTIFICATION LABELS**

- A. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch.

#### **2.3 CABLE TIES**

- A. General-Purpose Cable Ties: Fungus inert, self extinguishing, one piece, self locking, Type 6/6 nylon.
  - 1. Minimum Width: 3/16 inch.
  - 2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
  - 3. Temperature Range: Minus 40 to plus 185 deg F.
  - 4. Color: Black except where used for color-coding.
- B. 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.
  - 2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.

## **SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS**

3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black.

### **2.4 MISCELLANEOUS IDENTIFICATION PRODUCTS**

- A. Paint: Comply with requirements in Division 09 painting Sections for paint materials and application requirements. Select 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 INSTALLATION**

- A. Verify identity of each item before installing identification products.
- B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- C. Apply identification devices to surfaces that require finish after completing finish work.
- D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
- F. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
- G. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.
- H. 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.

### **3.2 IDENTIFICATION SCHEDULE**

- A. Power-Circuit Conductor Identification, 600 V or Less: For conductors in pull and junction boxes, use color-coding conductor tape to identify the phase.

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1. Color-Coding for Phase **and** Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded feeder and branch-circuit conductors.
  - a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG.
  - b. Colors for 208/120-V Circuits:
    - 1) Phase A: Black.
    - 2) Phase B: Red.
    - 3) Phase C: Blue.
  - c. Colors for 480/277-V Circuits:
    - 1) Phase A: Brown.
    - 2) Phase B: Orange.
    - 3) Phase C: Yellow.
  - d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches 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.
- B. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source.
- C. 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 the Operation and Maintenance Manual.
- D. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the 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 systems unless equipment is provided with its own identification.
  1. Labeling Instructions:
    - a. Indoor Equipment: Engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- high letters on 1-1/2-inch- high label; where two lines of text are required, use labels 2 inches high.
    - b. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
    - c. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.



## **SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS**

2. Equipment to Be Labeled:
  - a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be engraved, laminated acrylic or melamine label.
  - b. Enclosures and electrical cabinets.
  - c. Access doors and panels for concealed electrical items.
  - d. Emergency system boxes and enclosures.
  - e. Enclosed switches.
  - f. Enclosed circuit breakers.
  - g. Enclosed controllers.
  - h. Variable-speed controllers.
  - i. Remote-controlled switches, dimmer modules, and control devices.
  - j. Monitoring and control equipment.

**END OF SECTION 260553**

## **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. Indoor occupancy sensors.
- B. Related Requirements:
  - 1. Division 26 Section "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.

#### **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 INDOOR OCCUPANCY SENSORS**

- 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. Bryant Electric; a Hubbell company.
  - 2. Cooper Industries, Inc.
  - 3. Hubbell Building Automation, Inc.
  - 4. Leviton Mfg. Company Inc.
  - 5. Lightolier Controls.

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6. Lithonia Lighting; Acuity Lighting Group, Inc.
  7. Lutron Electronics Co., Inc.
  8. NSi Industries LLC; TORK Products.
  9. RAB Lighting.
  10. Sensor Switch, Inc.
  11. Square D; a brand of Schneider Electric.
  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 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.
  8. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; turn lights off when selected lighting level is present.
- C. 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- minimum movement of any portion of a human body that presents a target of not less than 36 sq. in., and detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
  3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch- high ceiling.

## SECTION 260923 - LIGHTING CONTROL DEVICES

### 2.2 SWITCHBOX-MOUNTED OCCUPANCY SENSORS

- 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. Bryant Electric; a Hubbell company.
  2. Cooper Industries, Inc.
  3. Hubbell Building Automation, Inc.
  4. Leviton Mfg. Company Inc.
  5. Lightolier Controls.
  6. Lithonia Lighting; Acuity Lighting Group, Inc.
  7. Lutron Electronics Co., Inc.
  8. NSi Industries LLC; TORK Products.
  9. RAB Lighting.
  10. Sensor Switch, Inc.
  11. Square D; a brand of Schneider Electric.
  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.
  3. Switch Rating: Not less than 800-VA fluorescent at 120 V, 1200-VA fluorescent at 277 V, and 800-W incandescent.
- C. Wall-Switch Sensor Tag WS1:
1. Standard Range: 180-degree field of view, field adjustable from 180 to 40 degrees; with a minimum coverage area of 900 sq. ft.
  2. Sensing Technology: Dual technology - PIR and ultrasonic.
  3. Switch Type: SP.
  4. Voltage: Match the circuit voltage.
  5. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc. The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.
  6. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.
  7. Concealed "off" time-delay selector at 30 seconds, and 5, 10, and 20 minutes.
  8. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.

### 2.3 CONDUCTORS AND CABLES

- A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

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- B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."
- C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 14AWG. Comply with requirements in Division 26 Section "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 WIRING INSTALLATION**

- A. Wiring Method: Comply with Division 26 Section "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 1/2 inch.
- 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.

#### **3.3 IDENTIFICATION**

- A. Identify components and power and control wiring according to Division 26 Section "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.

#### **3.4 FIELD QUALITY CONTROL**

- A. Perform the following tests and inspections:

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1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
  2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Lighting control devices will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

### **3.5 ADJUSTING**

- A. Occupancy Adjustments: When requested within three 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.

### **3.6 DEMONSTRATION**

- A. Coordinate demonstration of products specified in this Section with demonstration requirements for low-voltage, programmable lighting control systems specified in Division 26 Section "Network Lighting Controls."
- B. Train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices.

**END OF SECTION 260923**

## **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. Lighting and appliance branch-circuit panelboards.

#### **1.3 DEFINITIONS**

- A. SVR: Suppressed voltage rating.
- B. TVSS: Transient voltage surge suppressor.

#### **1.4 PERFORMANCE REQUIREMENTS**

- A. Seismic Performance: Panelboards shall withstand the effects of earthquake motions determined according to SEI/ASCE 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 panelboard, switching and overcurrent protective device, transient voltage suppression device, accessory, and component indicated. 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. Show tabulations of installed devices, equipment features, and ratings.
  - 2. Detail enclosure types and details for types other than NEMA 250, Type 1.
  - 3. Detail bus configuration, current, and voltage ratings.
  - 4. Short-circuit current rating of panelboards and overcurrent protective devices.
  - 5. Include evidence of NRTL listing for series rating of installed 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.

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8. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards. Submit on translucent log-log graph paper; include selectable ranges for each type of overcurrent protective device.

### **1.6 INFORMATIONAL SUBMITTALS**

- A. Seismic Qualification Certificates: Submit certification that panelboards, overcurrent protective devices, accessories, and components will withstand seismic forces defined in Division 26 Section "Vibration and Seismic Controls for Electrical Systems." Include the following:
  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. 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.
- C. Panelboard Schedules: For installation in panelboards.

### **1.7 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals.

### **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. Keys: Two spares for each type of panelboard cabinet lock.

### **1.9 QUALITY ASSURANCE**

- A. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.
- 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.



## SECTION 262416 - PANELBOARDS

- 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.

### 1.10 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.

### 1.11 PROJECT CONDITIONS

- A. Environmental Limitations:

- 1. Rate equipment for continuous operation under the following conditions unless otherwise indicated:

.Ambient Temperature: Not exceeding 23 deg F to plus 104 deg F.

- b. Altitude: Not exceeding 6600 feet.

- B. Service Conditions: NEMA PB 1, usual service conditions, as follows:

- 1. Ambient temperatures within limits specified.
  - 2. Altitude not exceeding 6600 feet.

- 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 Architect no fewer than five days in advance of proposed interruption of electric service.
  - 2. Do not proceed with interruption of electric service without Architect's written permission.

### 1.12 COORDINATION

- 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.

## SECTION 262416 - PANELBOARDS

### PART 2 - PRODUCTS

#### 2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

- A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."
- B. Enclosures: Flush mounted cabinets.
  - 1. Rated for environmental conditions at installed location.
    - a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
  - 2. Front: Secured to box with concealed trim clamps.
  - 3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
  - 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: Galvanized steel.
  - 5. Directory Card: Inside panelboard door, mounted in metal frame with transparent protective cover.
- C. Incoming Mains Location: Per the Drawings.
- D. Phase, Neutral, and Ground Buses:
  - 1. Material: Tin-plated aluminum.
  - 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.
- E. Conductor Connectors: Suitable for use with conductor material and sizes.
  - 1. Material: Tin-plated aluminum.
  - 2. Main and Neutral Lugs: Mechanical type.
  - 3. Ground Lugs and Bus-Configured Terminators: Mechanical type.
- F. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
- G. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

## SECTION 262416 - PANELBOARDS

### 2.2 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Manufacturer: Subject to compliance with requirements, provide products by the following:
  - 1. Square D; a brand of Schneider Electric.
- B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
- C. Mains: 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.

### 2.3 ELECTRONIC-GRADE PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Square D; a brand of Schneider Electric.
- B. Panelboards: NEMA PB 1; with factory-installed, integral TVSS; labeled by an NRTL for compliance with UL 67 after installing TVSS.
- C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
- D. Main Overcurrent Protective Devices: Bolt-on thermal-magnetic circuit breakers.
- E. Branch Overcurrent Protective Devices: Bolt-on thermal-magnetic circuit breakers.
- F. Buses:
  - 1. Copper phase and neutral buses; 200 percent capacity neutral bus and lugs.
  - 2. Copper equipment and isolated ground buses.
- G. Surge Protection Device: IEEE C62.41-compliant, integrally mounted, bolt-on, solid-state, parallel-connected, modular (with field-replaceable modules) type, with sine-wave tracking suppression and filtering modules, short-circuit current rating complying with UL 1449, second edition, and matching or exceeding the panelboard short-circuit rating, redundant suppression circuits, with individually fused metal-oxide varistors.
  - 1. Accessories:
    - a. Fuses rated at 200-kA interrupting capacity.
    - b. Fabrication using bolted compression lugs for internal wiring.
    - c. Integral disconnect switch.
    - d. Redundant suppression circuits.
    - e. Redundant replaceable modules.
    - f. Arrangement with wire connections to phase buses, neutral bus, and ground bus.
    - g. LED indicator lights for power and protection status.

## SECTION 262416 - PANELBOARDS

- h. Audible alarm, with silencing switch, to indicate when protection has failed.
  - i. Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of system operation. Contacts shall reverse position on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with building power monitoring and control system.
  - j. Four digit, transient-event counter set to totalize transient surges.
- 2. Peak Single-Impulse Surge Current Rating: 80 kA per mode/160 kA per phase.
  - 3. Minimum single-impulse current ratings, using 8-by-20-mic.sec. waveform described in IEEE C62.41.2.
    - a. Line to Neutral: 70,000 A.
    - b. Line to Ground: 70,000 A
    - c. Neutral to Ground: 50,000 A.
  - 4. Withstand Capabilities: 12,000 IEEE C62.41, Category C3 (10 kA), 8-by-20-mic.sec. surges with less than 5 percent change in clamping voltage.
  - 5. Protection modes and UL 1449 SVR for grounded wye circuits with 208Y/120-V, three-phase, four-wire circuits shall be as follows:
    - a. Line to Neutral: 400 V for 208Y/120.
    - b. Line to Ground: 400 V for 208Y/120..
    - c. Neutral to Ground: 400 V for 208Y/120..

### 2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Manufacturer: Subject to compliance with requirements, provide products by the following:
  - 1. Square D; a brand of Schneider Electric.
- B. 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.
    - a. Instantaneous trip.
    - b. Long- and short-time pickup levels.
    - c. Long- and short-time time adjustments.
    - d. Ground-fault pickup level, time delay, and  $I^2t$  response.
  - 2. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
  - 3. Molded-Case Circuit-Breaker (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 materials.

## SECTION 262416 - PANELBOARDS

- c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent lighting circuits.
- d. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
- e. Multipole units enclosed in a single housing or factory assembled to operate as a single unit.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Receive, inspect, handle, and store panelboards according to NECA 407.
- B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.
- C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 INSTALLATION

- A. Install panelboards and accessories according to NECA 407.
- B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.
- C. Comply with mounting and anchoring requirements specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."

above finished floor or grade. Mount top of trim 74 inches above finished floor unless otherwise indicated.

- E. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
- F. Install overcurrent protective devices and controllers not already factory installed.
- G. Install filler plates in unused spaces.
- H. Stub eight 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future.
- I. Arrange conductors in gutters into groups and bundle and wrap with wire ties.
- J. Comply with NECA 1.

## **SECTION 262416 - PANELBOARDS**

### **3.3 IDENTIFICATION**

- A. Create a directory to indicate installed circuit loads, incorporating Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.
- B. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

### **3.4 FIELD QUALITY CONTROL**

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
  - 1. Test insulation resistance for each panelboard bus, 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 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 three 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.
- D. Panelboards will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

**END OF SECTION 262416**

## **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. This Section includes the following:
  - 1. Receptacles, receptacles with integral GFCI, and associated device plates.
  - 2. Isolated-ground receptacles.
  - 3. Hospital-grade receptacles.
  - 4. Snap switches and wall-box dimmers.
  - 5. Solid-state fan speed controls.
  - 6. Communications outlets.
  - 7. Cord and plug sets.
  - 8. Floor service outlets and multioutlet assemblies.
- B. Related Sections include the following:
  - 1. Division 27 Section "Communications Horizontal Cabling" for workstation outlets.

#### **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. TVSS: Transient voltage surge suppressor.
- F. UTP: Unshielded twisted pair.

#### **1.4 ACTION SUBMITTALS**

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

#### **1.5 INFORMATIONAL SUBMITTALS**

- A. Field quality-control test reports.

## **SECTION 262726 - WIRING DEVICES**

### **1.6 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.

### **1.7 QUALITY ASSURANCE**

- A. Source Limitations: Obtain each type of wiring device and associated wall plate through one source from a single manufacturer. Insofar as they are available, obtain all wiring devices and associated wall plates from a single manufacturer and one source.
- 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 NFPA 70.

### **1.8 COORDINATION**

- A. Receptacles for Owner-Furnished Equipment: Match plug configurations.
  - 1. Cord and Plug Sets: Match equipment requirements.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
  - 1. Cooper Wiring Devices; a division of Cooper Industries, Inc. (Cooper).
  - 2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
  - 3. Leviton Mfg. Company Inc. (Leviton).
  - 4. Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour).

### **2.2 STRAIGHT BLADE RECEPTACLES**

- A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.
  - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Cooper; 5351 (single), 5352 (duplex).
    - b. Hubbell; HBL5351 (single), CR5352 (duplex).
    - c. Leviton; 5891 (single), 5352 (duplex).
    - d. Pass & Seymour; 5381 (single), 5352 (duplex).



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- B. Hospital-Grade, Duplex Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498 Supplement SD.
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Cooper; 8300 (duplex).
    - b. Hubbell; HBL8310 (single), HBL8300H (duplex).
    - c. Leviton; 8310 (single), 8300 (duplex).
    - d. Pass & Seymour; 9301-HG (single), 9300-HG (duplex).
- C. Isolated-Ground, Duplex Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Hubbell; CR 5253IG.
    - b. Leviton; 5362-IG.
    - c. Pass & Seymour; IG6300.
  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.
- D. Tamper-Resistant Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Cooper; TR8300.
    - b. Hubbell; HBL8300SG.
    - c. Leviton; 8300-SGG.
    - d. Pass & Seymour; 63H.
  2. Description: Labeled to comply with NFPA 70, "Health Care Facilities" Article, "Pediatric Locations" Section.

### 2.3 GFCI RECEPTACLES

- A. General Description: Straight blade, feed-through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.
- B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

## SECTION 262726 - WIRING DEVICES

- a. Cooper; GF20.
  - b. Pass & Seymour; 2084.
- C. Hospital-Grade, Duplex GFCI Convenience Receptacles, 125 V, 20 A: Comply with UL 498 Supplement SD.
- 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Cooper; HGF20.
    - b. Hubbell; HGF8300.
    - c. Leviton; 6898-HG.
    - d. Pass & Seymour; 2091-SHG.

### 2.4 CORD AND PLUG SETS

- A. Description: Match voltage and current ratings and number of conductors to requirements of equipment being connected.
- 1. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and equipment-rating ampacity plus a minimum of 30 percent.
  - 2. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

### 2.5 SNAP SWITCHES

- A. Comply with NEMA WD 1 and UL 20.
- B. Switches, 120/277 V, 20 A:
- 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Cooper; 2221 (single pole), 2222 (two pole), 2223 (three way), 2224 (four way).
    - b. Hubbell; CS1221 (single pole), CS1222 (two pole), CS1223 (three way), CS1224 (four way).
    - c. Leviton; 1221-2 (single pole), 1222-2 (two pole), 1223-2 (three way), 1224-2 (four way).
    - d. Pass & Seymour; 20AC1 (single pole), 20AC2 (two pole), 20AC3 (three way), 20AC4 (four way).
- C. Single-Pole, Double-Throw, Momentary Contact, Center-Off Switches, 120/277 V, 20 A; for use with mechanically held lighting contactors.
- 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Cooper; 1995.

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- b. Hubbell; HBL1557.
- c. Leviton; 1257.
- d. Pass & Seymour; 1251.

### 2.6 WALL-BOX DIMMERS

- A. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on-off switches, with audible frequency and EMI/RFI suppression filters.
- B. Control: Continuously adjustable slider; with single-pole or three-way switching. Comply with UL 1472.
- C. Fluorescent and LED Lamp Dimmer Switches: Modular; compatible with dimmer ballasts and drivers; trim potentiometer to adjust low-end dimming; dimmer-ballast/driver combination capable of consistent dimming with low end not greater than 10 percent of full brightness.

### 2.7 FAN SPEED CONTROLS

- A. Modular, 120-V, full-wave, solid-state units with integral, quiet on-off switches and audible frequency and EMI/RFI filters. Comply with UL 1917.
  - 1. Continuously adjustable slider, 5 A

### 2.8 COMMUNICATIONS OUTLETS

- A. Network Outlet:
  - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Cooper; 3560-6.
    - b. Leviton; 40649.
    - c. Ortronics
  - 2. Description: Single RJ-45 jack for terminating 100-ohm, balanced, four-pair UTP; TIA/EIA-568-B.1; complying with Category 5e. Comply with UL 1863.
- B. TV Outlet:
  - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Cooper; 3562.
    - b. Leviton; 40595.
    - c. Ortronics
  - 2. Description: Single Type F coaxial cable connector.

## **SECTION 262726 - WIRING DEVICES**

### **2.9 WALL PLATES**

- A. Single and combination types to match corresponding wiring devices.
  - 1. Plate-Securing Screws: Metal with head color to match plate finish.
  - 2. Material for Finished Spaces: Smooth, high-impact thermoplastic.
- 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, flap-type, dual-service units suitable for wiring method used.
- B. Compartments: Barrier separates power from voice and data communication cabling.
- C. Service Plate: Rectangular, die-cast aluminum with satin finish.
- D. Power Receptacle: NEMA WD 6 configuration 5-20R, gray finish, unless otherwise indicated.
- E. Voice and Data Communication Outlet: Two modular, keyed, color-coded, RJ-45 Category 5e jacks for UTP cable.

### **2.11 MULTIOUTLET ASSEMBLIES**

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Hubbell Incorporated; Wiring Device-Kellems.
  - 2. Wiremold Company (The).
- B. Components of Assemblies: Products from a single manufacturer designed for use as a complete, matching assembly of raceways and receptacles.
- C. Raceway Material: Metal, with manufacturer's standard finish.
- D. Wire: No. 12 AWG.

### **2.12 FINISHES**

- A. Color: Wiring device catalog numbers in Section Text do not designate device color.
  - 1. Wiring Devices Connected to Normal Power System: Ivory, unless otherwise indicated or required by NFPA 70 or device listing.
  - 2. Wiring Devices Connected to Emergency Power System: Red
  - 3. Isolated-Ground Receptacles: As specified above, with orange or green triangle on face.

## SECTION 262726 - WIRING DEVICES

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.
- B. Coordination with Other Trades:
  - 1. Take steps to ensure that devices and their boxes are protected. 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 the 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 wiring devices after all wall preparation, including painting, is complete.
- C. Conductors:
  - 1. Do not strip insulation from conductors until just 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 all devices that have been in temporary use during construction or that show signs that they 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 in length.
  - 5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
  - 6. Use a torque screwdriver when a torque is recommended or required by the 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:

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1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the left.
  2. Install hospital-grade receptacles in patient-care areas with the ground pin or neutral blade at the top.
- 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. Dimmers:
1. Install dimmers within terms of their listing.
  2. Verify that dimmers used for fan speed control are listed for that application.
  3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.
- H. 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.
- I. Adjust locations of floor service outlets to suit arrangement of partitions and furnishings.

### 3.2 IDENTIFICATION

- A. Comply with Division 26 Section "Identification for Electrical Systems."
1. Receptacles: Identify panelboard and circuit number from which served. Use hot, stamped or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

### 3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
1. In healthcare facilities, prepare reports that comply with recommendations in NFPA 99.
  2. Test Instruments: Use instruments that comply with UL 1436.
  3. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated LED 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 not acceptable.
  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. The 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.

## **SECTION 262726 - WIRING DEVICES**

- C. Test straight blade hospital-grade convenience outlets for the retention force of the grounding blade according to NFPA 99. Retention force shall be not less than 4 oz.. Include devices provided with the equipment.

**END OF SECTION 262726**

## **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. Nonfusible switches.
  - 2. Molded-case circuit breakers (MCCBs).
  - 3. Molded-case switches.
  - 4. Enclosures.

#### **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 and the unit will be fully operational after the seismic event."

#### **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.



## **SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS**

### **1.6 INFORMATIONAL SUBMITTALS**

- A. 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.
- B. 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.

### **1.7 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 Division 01 Section "Operation and Maintenance Data," include the following:

### **1.8 QUALITY ASSURANCE**

- A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.
- B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Comply with NFPA 70.

### **1.9 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 and not exceeding 104 deg F.
  - 2. Altitude: Not exceeding 6600 feet.

## **SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS**

- B. 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 Architect no fewer than five days in advance of proposed interruption of electric service.
  2. Indicate method of providing temporary electric service.
  3. Do not proceed with interruption of electric service without **Architect's** written permission.

### **1.10 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 NONFUSIBLE SWITCHES**

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
  2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
  3. Siemens Energy & Automation, Inc.
  4. Square D; a brand of 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. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- D. Accessories:
1. Equipment Ground Kit: Internally mounted and labeled for copper ground conductors.
  2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper neutral conductors.
  3. Lugs: Mechanical type, suitable for number, size, and conductor material.

### **2.2 MOLDED-CASE CIRCUIT BREAKERS**

- 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:

## **SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS**

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
  2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
  3. Siemens Energy & Automation, Inc.
  4. Square D; a brand of Schneider Electric.
- B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.
- C. 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.
- D. Ground-Fault, Equipment-Protection (GFEP) Circuit Breakers: With Class B ground-fault protection (30-mA trip).
- E. Features and Accessories:
1. Standard frame sizes, trip ratings, and number of poles.
  2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
  3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.
  4. Ground-Fault Protection: Comply with UL 1053; integrally mounted, self-powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.

### **2.3 MOLDED-CASE SWITCHES**

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
  2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
  3. Siemens Energy & Automation, Inc.
  4. Square D; a brand of Schneider Electric.
- B. General Requirements: MCCB with fixed, high-set instantaneous trip only, and short-circuit withstand rating equal to equivalent breaker frame size interrupting rating.
- C. Features and Accessories:
1. Standard frame sizes and number of poles.
  2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
  3. Ground-Fault Protection: Comply with UL 1053; remote-mounted and powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.

## **SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS**

### **2.4 ENCLOSURES**

- A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
  - 1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
  - 2. Outdoor Locations: NEMA 250, Type 4X

## **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 Division 26 Section "Vibration and Seismic Controls for Electrical Systems."
- C. Comply with NECA 1.

### **3.3 IDENTIFICATION**

- A. Comply with requirements in Division 26 Section "Identification for Electrical Systems."
  - 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
  - 2. Label each enclosure with engraved laminated-plastic nameplate.

### **3.4 FIELD QUALITY CONTROL**

- A. Perform tests and inspections.
- 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.

## **SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS**

### **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.

### **D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.**

**END OF SECTION 262816**

## **SECTION 262913 - ENCLOSED CONTROLLERS**

### **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 enclosed controllers rated 600 V and less:
  - 1. Full-voltage manual.
  - 2. Full-voltage magnetic.

#### **1.3 DEFINITIONS**

- A. CPT: Control power transformer.
- B. MCCB: Molded-case circuit breaker.
- C. MCP: Motor circuit protector.
- D. N.C.: Normally closed.
- E. N.O.: Normally open.
- F. OCPD: Overcurrent protective device.
- G. SCR: Silicon-controlled rectifier.

#### **1.4 PERFORMANCE REQUIREMENTS**

- A. Seismic Performance: Enclosed controllers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
  - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

#### **1.5 ACTION SUBMITTALS**

- A. Product Data: For each type of enclosed controller. Include manufacturer's technical data on features, performance, electrical characteristics, ratings, and enclosure types and finishes.

## **SECTION 262913 - ENCLOSED CONTROLLERS**

- B. Shop Drawings: For each enclosed controller. Include dimensioned plans, elevations, sections, details, and required clearances and service spaces around controller enclosures.
  - 1. Show tabulations of the following:
    - a. Each installed unit's type and details.
    - b. Factory-installed devices.
    - c. Nameplate legends.
    - d. Short-circuit current rating of integrated unit.
    - e. Features, characteristics, ratings, and factory settings of individual OCPDs in combination controllers.
  - 2. Wiring Diagrams: For power, signal, and control wiring.

### **1.6 INFORMATIONAL SUBMITTALS**

- A. Seismic Qualification Certificates: For enclosed controllers, 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. Field quality-control reports.
- C. Load-Current and List of Settings of Adjustable Overload Relays: Compile after motors have been installed, and arrange to demonstrate that switch settings for motor running overload protection suit actual motors to be protected.

### **1.7 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: For enclosed controllers to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
  - 1. Routine maintenance requirements for enclosed controllers and installed components.
  - 2. Manufacturer's written instructions for setting field-adjustable overload relays.

### **1.8 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. Comply with NFPA 70.

## **SECTION 262913 - ENCLOSED CONTROLLERS**

- C. IEEE Compliance: Fabricate and test enclosed controllers according to IEEE 344 to withstand seismic forces defined in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."

### **1.9 DELIVERY, STORAGE, AND HANDLING**

- A. Store enclosed controllers indoors in clean, dry space with uniform temperature to prevent condensation. Protect enclosed controllers from exposure to dirt, fumes, water, corrosive substances, and physical damage.

### **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 and not exceeding 104 deg F.
  - 2. Altitude: Not exceeding 6600 feet.

### **1.11 COORDINATION**

- A. Coordinate layout and installation of enclosed controllers with other construction including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

## **PART 2 - PRODUCTS**

### **2.1 FULL-VOLTAGE CONTROLLERS**

- A. General Requirements for Full-Voltage Controllers: Comply with NEMA ICS 2, general purpose, Class A.
- B. Motor-Starting Switches: "Quick-make, quick-break" toggle action; marked to show whether unit is off or on.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
    - b. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
    - c. Rockwell Automation, Inc.; Allen-Bradley brand.
    - d. Siemens Energy & Automation, Inc.
    - e. Square D; a brand of Schneider Electric.
  - 2. Configuration: Nonreversing.
  - 3. Surface mounting.
  - 4. Red LED pilot light.



## SECTION 262913 - ENCLOSED CONTROLLERS

- C. Magnetic Controllers: Full voltage, across the line, electrically held.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
    - b. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
    - c. Rockwell Automation, Inc.; Allen-Bradley brand.
    - d. Siemens Energy & Automation, Inc.
    - e. Square D; a brand of Schneider Electric.
  2. Configuration: Nonreversing.
  3. Contactor Coils: Pressure-encapsulated type.
    - a. Operating Voltage: Depending on contactor NEMA size and line-voltage rating, manufacturer's standard matching control power or line voltage.
  4. Power Contacts: Totally enclosed, double-break, silver-cadmium oxide; assembled to allow inspection and replacement without disturbing line or load wiring.
  5. Control Circuits: 120-V ac; obtained from integral CPT, with primary and secondary fuses with CPT of sufficient capacity to operate integral devices and remotely located pilot, indicating, and control devices.
    - a. CPT Spare Capacity: 100 VA.
  6. Solid-State Overload Relay:
    - a. Switch or dial selectable for motor running overload protection.
    - b. Sensors in each phase.
    - c. Class 10 tripping characteristic selected to protect motor against voltage and current unbalance and single phasing.
    - d. Class II ground-fault protection, with start and run delays to prevent nuisance trip on starting.
  7. N.C. isolated overload alarm contact.
  8. External overload reset push button.
  9. Red LED pilot light.
  10. Control switches as noted in the Drawings.

### 2.2 ENCLOSURES

- A. Enclosed Controllers: NEMA ICS 6, to comply with environmental conditions at installed location.
1. Dry and Clean Indoor Locations: Type 1.
  2. Outdoor Locations: Type 4X.

## **SECTION 262913 - ENCLOSED CONTROLLERS**

### **2.3 ACCESSORIES**

- A. General Requirements for Control Circuit and Pilot Devices: NEMA ICS 5; factory installed in controller enclosure cover unless otherwise indicated.
  - 1. Push Buttons, Pilot Lights, and Selector Switches: Heavy-duty, oiltight type.
    - a. Push Buttons: Shrouded types; momentary as indicated.
    - b. Pilot Lights: LED types; colors as indicated.
    - c. Selector Switches: Rotary type.
- B. Reversible N.C./N.O. auxiliary contact(s).
- C. Control Relays: Auxiliary and adjustable solid-state time-delay relays.
- D. Cover gaskets for Type 1 enclosures.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine areas and surfaces to receive enclosed controllers, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
- B. Examine enclosed controllers before installation. Reject enclosed controllers that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 INSTALLATION**

- A. Wall-Mounted Controllers: Install enclosed controllers on walls with tops at uniform height unless otherwise indicated, and by bolting units to wall or mounting on lightweight structural-steel channels bolted to wall. For controllers not at walls, provide freestanding racks complying with Division 26 Section "Hangers and Supports for Electrical Systems."
- B. Seismic Bracing: Comply with requirements specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."
- C. Comply with NECA 1.

### **3.3 IDENTIFICATION**

- A. Identify enclosed controllers, components, and control wiring. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."
  - 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.

## SECTION 262913 - ENCLOSED CONTROLLERS

2. Label each enclosure with engraved nameplate.
3. Label each enclosure-mounted control and pilot device.

### 3.4 CONTROL WIRING INSTALLATION

- A. Install wiring between enclosed controllers and remote devices and facility's central control system. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."
- B. Bundle, train, and support wiring in enclosures.
- C. Connect selector switches and other automatic-control selection devices where applicable.
  1. Connect selector switches with enclosed-controller circuit in both manual and automatic positions for safety-type control devices such as low- and high-pressure cutouts, high-temperature cutouts, and motor overload protectors.

### 3.5 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
  1. Test insulation resistance for each enclosed controller, component, connecting supply, feeder, and control circuit.
  2. Test continuity of each circuit.
- C. Tests and Inspections:
  1. Inspect controllers, wiring, components, connections, and equipment installation..
  2. Test insulation resistance for each enclosed-controller element, component, connecting motor supply, feeder, and control circuits.
  3. Test continuity of each circuit.
  4. Verify that voltages at controller locations are within plus or minus 10 percent of motor nameplate rated voltages. If outside this range for any motor, notify Architect before starting the motor(s).
  5. Test each motor for proper phase rotation.
  6. Perform each electrical test and visual and mechanical inspection stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
  7. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
  8. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Enclosed controllers will be considered defective if they do not pass tests and inspections.

## **SECTION 262913 - ENCLOSED CONTROLLERS**

### **3.6 ADJUSTING**

- A. Set field-adjustable switches, auxiliary relays, time-delay relays, timers, and overload-relay pickup and trip ranges.

### **3.7 PROTECTION**

- A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions until enclosed controllers are ready to be energized and placed into service.
- B. Replace controllers whose interiors have been exposed to water or other liquids prior to Substantial Completion.

### **3.8 DEMONSTRATION**

- A. Train Owner's maintenance personnel to adjust, operate, and maintain enclosed controllers.

**END OF SECTION 262913**

## **SECTION 265100 - INTERIOR 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. Interior lighting fixtures, lamps, drivers, and ballasts.
2. Exit signs.
3. Lighting fixture supports.

B. Related Sections:

1. Division 26 Section "Lighting Control Devices" for automatic control of lighting, including occupancy sensors.
2. Division 26 Section "Wiring Devices" for manual wall-box dimmers.

#### **1.3 DEFINITIONS**

- A. BF: Ballast factor.
- B. CCT: Correlated color temperature.
- C. CRI: Color-rendering index.
- D. HID: High-intensity discharge.
- E. LER: Luminaire efficacy rating.
- F. Lumen: Measured output of lamp and luminaire, or both.
- G. Luminaire: Complete lighting fixture, including ballast housing if provided.

#### **1.4 ACTION SUBMITTALS**

- A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:
  1. Physical description of lighting fixture including dimensions.
  2. Emergency lighting units including battery and charger.
  3. Ballast, including BF.
  4. Energy-efficiency data.

## **SECTION 265100 - INTERIOR LIGHTING**

5. Life, output (lumens, CCT, and CRI), and energy-efficiency data for lamps.
6. Photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing & Calculation Guides, of each lighting fixture type. The adjustment factors shall be for lamps, ballasts, and accessories identical to those indicated for the lighting fixture as applied in this Project.

- a. **Manufacturer Certified Data:** Photometric data shall be certified by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

- B. **Shop Drawings:** For nonstandard or custom lighting fixtures. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. **Wiring Diagrams:** For power, signal, and control wiring.

- C. Installation instructions.

### **1.5 INFORMATIONAL SUBMITTALS**

- A. Field quality-control reports.
- B. **Warranty:** Sample of special warranty.

### **1.6 CLOSEOUT SUBMITTALS**

- A. **Operation and Maintenance Data:** For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals.
  1. Provide a list of all lamp, ballast, and driver types used on Project; use ANSI and manufacturers' codes.

### **1.7 QUALITY ASSURANCE**

- A. **Luminaire Photometric Data Testing Laboratory Qualifications:** Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.
- 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 NFPA 70.

## **SECTION 265100 - INTERIOR LIGHTING**

### **1.8 COORDINATION**

- A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Products: Subject to compliance with requirements, provide products indicated on Drawings.

### **2.2 GENERAL REQUIREMENTS FOR LIGHTING FIXTURES AND COMPONENTS**

- A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.
- B. Fluorescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5 and NEMA LE 5A as applicable.
- C. LED Fixtures: Comply with UL. Where LER is specified, test according to NEMA LE 5.
- D. Metal Parts: Free of burrs and sharp corners and edges.
- E. Sheet Metal Components: Steel unless otherwise indicated. Form and support to prevent warping and sagging.
- F. 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.
- G. Diffusers and Globes:
  - 1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
    - a. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.
    - b. UV stabilized.
  - 2. Glass: Annealed crystal glass unless otherwise indicated.
- H. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps and ballasts. 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 and ballast characteristics:
    - a. "USE ONLY" and include specific lamp type.

## SECTION 265100 - INTERIOR LIGHTING

- b. Lamp diameter code (T-4, T-5, T-8, T-12, etc.), tube configuration (twin, quad, triple, etc.), base type, and nominal wattage for fluorescent and compact fluorescent luminaires.
- c. Start type (preheat, rapid start, instant start, etc.) for fluorescent and compact fluorescent luminaires.
- d. CCT and CRI for all luminaires.

### 2.3 BALLASTS FOR LINEAR FLUORESCENT LAMPS

#### A. General Requirements for Electronic Ballasts:

- 1. Comply with UL 935 and with ANSI C82.11.
- 2. Designed for type and quantity of lamps served.
- 3. Ballasts shall be designed for full light output unless another BF, dimmer, or bi-level control is indicated.
- 4. Sound Rating: Class A.
- 5. Total Harmonic Distortion Rating: Less than 10 percent.
- 6. Transient Voltage Protection: IEEE C62.41.1 and IEEE C62.41.2, Category A or better.
- 7. Operating Frequency: 42 kHz or higher.
- 8. Lamp Current Crest Factor: 1.7 or less.
- 9. BF: 0.88, or higher.
- 10. Power Factor: 0.95, or higher.
- 11. Parallel Lamp Circuits: Multiple lamp ballasts shall comply with ANSI C82.11 and shall be connected to maintain full light output on surviving lamps if one or more lamps fail.

#### B. Luminaires controlled by occupancy sensors shall have programmed-start ballasts.

#### C. Electronic Programmed-Start Ballasts for T8, T5, and T5HO Lamps: Comply with ANSI C82.11 and the following:

- 1. Lamp end-of-life detection and shutdown circuit for T5 diameter lamps.
- 2. Automatic lamp starting after lamp replacement.

#### D. Single Ballasts for Multiple Lighting Fixtures: Factory wired with ballast arrangements and bundled extension wiring to suit final installation conditions without modification or rewiring in the field.

#### E. Ballasts and Drivers for Dimmer-Controlled Lighting Fixtures: Electronic type.

- 1. Dimming Range: 100 to 5 percent of rated lamp lumens.
- 2. Ballast Input Watts: Can be reduced to 20 percent of normal.
- 3. Compatibility: Certified by manufacturer for use with specific dimming control system and lamp type indicated.
- 4. Control: Coordinate wiring from ballast or driver to control device to ensure that the ballast, driver, controller, and connecting wiring are compatible.



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### **2.4 BALLASTS FOR COMPACT FLUORESCENT LAMPS**

- A. Description: Electronic-programmed rapid-start type, complying with UL 935 and with ANSI C 82.11, designed for type and quantity of lamps indicated. Ballast shall be designed for full light output unless dimmer or bi-level control is indicated:
1. Lamp end-of-life detection and shutdown circuit.
  2. Automatic lamp starting after lamp replacement.
  3. Sound Rating: Class A.
  4. Total Harmonic Distortion Rating: Less than 20 percent.
  5. Transient Voltage Protection: IEEE C62.41.1 and IEEE C62.41.2, Category A or better.
  6. Operating Frequency: 20 kHz or higher.
  7. Lamp Current Crest Factor: 1.7 or less.
  8. BF: 0.95 or higher unless otherwise indicated.
  9. Power Factor: 0.95, or higher.
  10. Interference: Comply with 47 CFR 18, Ch. 1, Subpart C, for limitations on electromagnetic and radio-frequency interference for nonconsumer equipment.

### **2.5 DRIVERS FOR LED LAMPS**

- A. General Requirements for Electronic Drivers:
1. Comply with UL and ANSI C82.11
  2. Designed for type and quantity of lamps served.
  3. Drivers shall be designed for full light output unless dimmer control is indicated.
  4. Drivers shall operate at 60 Hz.
  5. Sound Rating: Class A.
  6. Total Harmonic Distortion Rating: Less than 20 percent.
  7. Transient Voltage Protection: IEEE C62.41.1 and IEEE C62.41.2, Category A or better.
  8. BF: 0.90, or higher.
  9. Power Factor: 0.95, or higher.

### **2.6 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. Lamps for AC Operation: LEDs, 50,000 hours minimum rated lamp life.

### **2.7 FLUORESCENT LAMPS**

- A. T8 rapid-start lamps, rated 32 W maximum, nominal length of 48 inches, 2800 initial lumens (minimum), CRI 75 (minimum), color temperature 3500 K, and average rated life 20,000 hours unless otherwise indicated.

## SECTION 265100 - INTERIOR LIGHTING

- B. T8 rapid-start lamps, rated 17 W maximum, nominal length of 24 inches, 1300 initial lumens (minimum), CRI 75 (minimum), color temperature 3500 K, and average rated life of 20,000 hours unless otherwise indicated.
- C. T5 rapid-start lamps, rated 28 W maximum, nominal length of 45.2 inches, 2900 initial lumens (minimum), CRI 85 (minimum), color temperature 3500 K, and average rated life of 20,000 hours unless otherwise indicated.
- D. T5HO rapid-start, high-output lamps, rated 54 W maximum, nominal length of 45.2 inches, 5000 initial lumens (minimum), CRI 85 (minimum), color temperature 3500 K, and average rated life of 20,000 hours unless otherwise indicated.
- E. Compact Fluorescent Lamps: 4-Pin, CRI 80 (minimum), color temperature 3500 K, average rated life of 10,000 hours at three hours operation per start, and suitable for use with dimming ballasts unless otherwise indicated.
  - 1. 26 W: T4, double or triple tube, rated 1800 initial lumens (minimum).
  - 2. 32 W: T4, triple tube, rated 2400 initial lumens (minimum).
  - 3. 42 W: T4, triple tube, rated 3200 initial lumens (minimum).

### 2.8 LIGHTING FIXTURE SUPPORT COMPONENTS

- A. Comply with Division 26 Section "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and nonmetallic channel and angle supports.
- B. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage.
- C. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Lighting fixtures:
  - 1. Set level, plumb, and square with ceilings and walls unless otherwise indicated.
  - 2. Install lamps in luminaires as required.
- B. Temporary Lighting: If it is necessary, and approved by Architect, to use permanent luminaires for temporary lighting, install and energize the minimum number of luminaires necessary. When construction is sufficiently complete, remove the temporary luminaires, disassemble, clean thoroughly, install new lamps, and reinstall.
- C. Lay-in Ceiling Lighting Fixtures Supports: Use grid as a support element.
  - 1. Install ceiling support system rods or wires, independent of the ceiling suspension devices, for each fixture. Locate not more than 6 inches from lighting fixture corners.
  - 2. Support Clips: Fasten to lighting fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.

## **SECTION 265100 - INTERIOR LIGHTING**

3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees.
  4. Install at least two independent support rods or wires from structure to tabs on diagonal corners of the lighting fixture. Wire or rod shall have breaking strength of the weight of fixture at a safety factor of 3.
- D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

### **3.2 IDENTIFICATION**

- A. Install labels with panel and circuit numbers on concealed junction and outlet boxes.

### **3.3 STARTUP SERVICE**

- A. Burn-in all lamps that require specific aging period to operate properly, prior to occupancy by Owner. Burn-in fluorescent and compact fluorescent lamps intended to be dimmed, for at least 100 hours at full voltage.

**END OF SECTION 265100**

## **SECTION 271100 - COMMUNICATIONS EQUIPMENT ROOM FITTINGS**

### **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. Telecommunications mounting elements.
  - 2. Grounding.

- B. Related Sections:

- 1. Division 27 Section "Communications Horizontal Cabling" for voice and data cabling associated with system panels and devices.
  - 2. Division 28 Section "Conductors and Cables for Electronic Safety and Security" for cabling used for Building Automation System, nurse call, access controls, and fire alarm.

#### **1.3 DEFINITIONS**

- A. Basket Cable Tray: A fabricated structure consisting of wire mesh bottom and side rails.
- B. BICSI: Building Industry Consulting Service International.
- C. Channel Cable Tray: A fabricated structure consisting of a one-piece, ventilated-bottom or solid-bottom channel not exceeding 6 inches in width.
- D. Ladder Cable Tray: A fabricated structure consisting of two longitudinal side rails connected by individual transverse members (rungs).
- E. LAN: Local area network.
- F. RCDD: Registered Communications Distribution Designer.
- G. Solid-Bottom or Nonventilated Cable Tray: A fabricated structure consisting of a bottom without ventilation openings within integral or separate longitudinal side rails.
- H. Trough or Ventilated Cable Tray: A fabricated structure consisting of integral or separate longitudinal rails and a bottom having openings sufficient for the passage of air and using 75 percent or less of the plan area of the surface to support cables.

## **SECTION 271100 - COMMUNICATIONS EQUIPMENT ROOM FITTINGS**

### **1.4 ACTION SUBMITTALS**

- A. **Product Data:** For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for equipment. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

### **1.5 INFORMATIONAL SUBMITTALS**

- A. **Qualification Data:** For installer, qualified layout technician, and installation supervisor.

### **1.6 QUALITY ASSURANCE**

- A. **Installer Qualifications:** Cabling Installer must have personnel certified by BICSI on staff.
  - 1. **Layout Responsibility:** Preparation of Shop Drawings shall be under the direct supervision of Commercial Installer, Level 2.
  - 2. **Installation Supervision:** Installation shall be under the direct supervision of Level 2 Installer, who shall be present at all times when Work of this Section is performed at Project site.
- 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. **Telecommunications Pathways and Spaces:** Comply with TIA/EIA-569-A.
- D. **Grounding:** Comply with ANSI-J-STD-607-A.

### **1.7 COORDINATION**

- A. **Coordinate layout and installation of communications equipment with Owner's telecommunications and LAN equipment.**
  - 1. Meet jointly with telecommunications and LAN equipment suppliers, and Owner to exchange information and agree on details of equipment arrangements and installation interfaces.
  - 2. Record agreements reached in meetings and distribute them to other participants.
  - 3. Adjust arrangements and locations of cross-connects and patch panels in equipment rooms to accommodate and optimize arrangement and space requirements of LAN equipment.
  - 4. Adjust arrangements and locations of equipment with cross-connects and patch panels of cabling systems of other communications, electronic safety and security, and related systems that share space in the equipment room.

## **SECTION 271100 - COMMUNICATIONS EQUIPMENT ROOM FITTINGS**

### **PART 2 - PRODUCTS**

#### **2.1 PATHWAYS**

- A. General Requirements: Comply with TIA/EIA-569-A.
- B. Cable Support: NRTL labeled. Cable support brackets shall be designed to prevent degradation of cable performance and pinch points that could damage cable. Cable tie slots fasten cable ties to brackets.
  - 1. Comply with NFPA 70 and UL 2043 for fire-resistant and low-smoke-producing characteristics.
  - 2. Support brackets with cable tie slots for fastening cable ties to brackets.
  - 3. Lacing bars, spools, J-hooks, and D-rings.
  - 4. Straps and other devices.
- C. Conduit and Boxes: Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems." Flexible metal conduit shall not be used.
  - 1. Outlet boxes shall be no smaller than 4.5 inches wide, 4.5 inches high, and 2-1/2 inches deep.

#### **2.2 EQUIPMENT FRAMES**

- 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. ADC.
  - 2. Aim Electronics; a brand of Emerson Electric Co.
  - 3. AMP; a Tyco International Ltd. company.
  - 4. Cooper B-Line, Inc.
  - 5. Hubbell Premise Wiring.
  - 6. KRONE Incorporated.
  - 7. Leviton Voice & Data Division.
  - 8. Middle Atlantic Products, Inc.
  - 9. Nordex/CDT; a subsidiary of Cable Design Technologies.
  - 10. Ortronics, Inc.
  - 11. Panduit Corp.
  - 12. Siemon Co. (The).
- B. General Frame Requirements:
  - 1. Module Dimension: Width compatible with EIA 310 standard, 19-inch panel mounting.
  - 2. Finish: Manufacturer's standard, baked-polyester powder coat.
- C. Cable Management for Equipment Frames:
  - 1. Metal, with integral wire retaining fingers.
  - 2. Baked-polyester powder coat finish.

## **SECTION 271100 - COMMUNICATIONS EQUIPMENT ROOM FITTINGS**

3. Provide horizontal crossover cable manager at the top of each relay rack and patch panel, with a minimum height of two rack units each.

### **2.3 GROUNDING**

- A. Comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems." for grounding conductors and connectors.
- B. Comply with ANSI-J-STD-607-A.

### **2.4 LABELING**

- A. Comply with TIA/EIA-606-A and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Comply with NECA 1.
- B. Comply with BICSI TDMM for layout and installation of communications equipment rooms.
- C. Cable Trays: Comply with NEMA VE 2 and TIA/EIA-569-A-7.
- D. Bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

### **3.2 FIRESTOPPING**

- A. Comply with requirements in Division 07 Section "Penetration Firestopping."
- B. Comply with TIA/EIA-569-A, Annex A, "Firestopping."
- C. Comply with BICSI TDMM, "Firestopping Systems" Article.

### **3.3 GROUNDING**

- A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.
- B. Comply with ANSI-J-STD-607-A.
- C. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

## **SECTION 271100 - COMMUNICATIONS EQUIPMENT ROOM FITTINGS**

1. Bond the shield of shielded cable to the grounding bus bar in communications rooms and spaces.

### **3.4 IDENTIFICATION**

- A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements in Division 26 Section "Identification for Electrical Systems."
- B. Labels shall be preprinted or computer-printed type.

**END OF SECTION 271100**



## **SECTION 271500 - COMMUNICATIONS HORIZONTAL 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. Pathways.
2. UTP cabling.
3. Coaxial cable.
4. Cable connecting hardware, patch panels, and cross-connects.
5. Telecommunications outlet/connectors.
6. Cabling system identification products.

B. Related Sections:

1. Division 28 Section "Conductors and Cables for Electronic Safety and Security" for voice and data cabling associated with system panels and devices.

#### **1.3 DEFINITIONS**

- A. Basket Cable Tray: A fabricated structure consisting of wire mesh bottom and side rails.
- B. BICSI: Building Industry Consulting Service International.
- C. Channel Cable Tray: A fabricated structure consisting of a one-piece, ventilated-bottom or solid-bottom channel.
- D. Consolidation Point: A location for interconnection between horizontal cables extending from building pathways and horizontal cables extending into furniture pathways.
- E. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.
- F. EMI: Electromagnetic interference.
- G. IDC: Insulation displacement connector.
- H. Ladder Cable Tray: A fabricated structure consisting of two longitudinal side rails connected by individual transverse members (rungs).
- I. LAN: Local area network.

## SECTION 271500 - COMMUNICATIONS HORIZONTAL CABLING

- J. MUTOA: Multiuser telecommunications outlet assembly, a grouping in one location of several telecommunications outlet/connectors.
- K. Outlet/Connectors: A connecting device in the work area on which horizontal cable or outlet cable terminates.
- L. RCDD: Registered Communications Distribution Designer.
- M. Solid-Bottom or Nonventilated Cable Tray: A fabricated structure consisting of longitudinal side rails and a bottom without ventilation openings.
- N. Trough or Ventilated Cable Tray: A fabricated structure consisting of longitudinal side rails and a bottom having openings for the passage of air.
- O. UTP: Unshielded twisted pair.

### 1.4 HORIZONTAL CABLING DESCRIPTION

- A. Horizontal cable and its connecting hardware provide the means of transporting signals between the telecommunications outlet/connector and the horizontal cross-connect located in the communications equipment room. This cabling and its connecting hardware are called "permanent link," a term that is used in the testing protocols.
  - 1. Bridged taps and splices shall not be installed in the horizontal cabling.
- B. The maximum allowable horizontal cable length is 295 feet. This maximum allowable length does not include an allowance for the length of 16 feet to the workstation equipment. The maximum allowable length does not include an allowance for the length of 16 feet in the horizontal cross-connect.

### 1.5 PERFORMANCE REQUIREMENTS

- A. General Performance: Horizontal cabling system shall comply with transmission standards in TIA/EIA-568-B.1, when tested according to test procedures of this standard.

### 1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
  - 1. For coaxial cable, include the following installation data for each type used:
    - a. Nominal OD.
    - b. Minimum bending radius.
    - c. Maximum pulling tension.
- B. Shop Drawings:
  - 1. System Labeling Schedules: Electronic copy of labeling schedules, in software and format selected by Owner.

## **SECTION 271500 - COMMUNICATIONS HORIZONTAL CABLING**

2. Cabling administration drawings and printouts.
3. Wiring diagrams to show typical wiring schematics, including the following:
  - a. Cross-connects.
  - b. Patch panels.
  - c. Patch cords.
4. Cross-connects and patch panels. Detail mounting assemblies, and show elevations and physical relationship between the installed components.

### **1.7 INFORMATIONAL SUBMITTALS**

- A. Qualification Data: For installer, qualified layout technician, and installation supervisor.
- B. Source quality-control reports.
- C. Field quality-control reports.

### **1.8 CLOSEOUT SUBMITTALS**

- A. Maintenance Data: For connectors to include in maintenance manuals.

### **1.9 QUALITY ASSURANCE**

- A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.
  1. Layout Responsibility: Preparation of Shop Drawings, Cabling Administration Drawings, and field testing program development..
  2. Installation Supervision: Installation shall be under the direct supervision of Level 2 Installer, who shall be present at all times when Work of this Section is performed at Project site.
  3. Testing Supervisor: Currently certified by BICSI, to supervise on-site testing.
- B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  1. Flame-Spread Index: 25 or less.
  2. Smoke-Developed Index: 50 or less.
- C. 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. Telecommunications Pathways and Spaces: Comply with TIA/EIA-569-A.
- E. Grounding: Comply with ANSI-J-STD-607-A.

## **SECTION 271500 - COMMUNICATIONS HORIZONTAL CABLING**

### **1.10 DELIVERY, STORAGE, AND HANDLING**

- A. Test cables upon receipt at Project site.
  - 1. Test each pair of UTP cable for open and short circuits.

### **1.11 PROJECT CONDITIONS**

- A. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

### **1.12 COORDINATION**

- A. Coordinate layout and installation of telecommunications pathways and cabling with Owner's telecommunications and LAN equipment suppliers.

## **PART 2 - PRODUCTS**

### **2.1 UTP CABLE**

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Belden CDT Inc.; Electronics Division.
  - 2. Berk-Tek; a Nexans company.
  - 3. CommScope, Inc.
  - 4. Draka USA.
  - 5. Genesis Cable Products; Honeywell International, Inc.
  - 6. KRONE Incorporated.
  - 7. Mohawk; a division of Belden CDT.
  - 8. Nordex/CDT; a subsidiary of Cable Design Technologies.
  - 9. Superior Essex Inc.
  - 10. SYSTIMAX Solutions; a CommScope, Inc. brand.
  - 11. 3M.
  - 12. Tyco Electronics/AMP Netconnect; Tyco International Ltd.
- B. Description: 100-ohm, 4-pair UTP, formed into 25-pair, binder groups covered with a blue thermoplastic jacket.
  - 1. Comply with ICEA S-90-661 for mechanical properties.
  - 2. Comply with TIA/EIA-568-B.1 for performance specifications.
  - 3. Comply with TIA/EIA-568-B.2, Category 5e.
  - 4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:

## SECTION 271500 - COMMUNICATIONS HORIZONTAL CABLING

- a. Communications, General Purpose: Type CM or CMG.
- b. Communications, Plenum Rated: Type CMP, complying with NFPA 262.
- c. Communications, Riser Rated: Type CMR, complying with UL 1666.
- d. Communications, Limited Purpose: Type CMX.
- e. Multipurpose: Type MP or MPG.
- f. Multipurpose, Plenum Rated: Type MPP, complying with NFPA 262.
- g. Multipurpose, Riser Rated: Type MPR, complying with UL 1666.

### 2.2 UTP CABLE HARDWARE

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. American Technology Systems Industries, Inc.
  - 2. Dynacom Corporation.
  - 3. Hubbell Premise Wiring.
  - 4. KRONE Incorporated.
  - 5. Leviton Voice & Data Division.
  - 6. Molex Premise Networks; a division of Molex, Inc.
  - 7. Nordex/CDT; a subsidiary of Cable Design Technologies.
  - 8. Panduit Corp.
  - 9. Siemon Co. (The).
  - 10. Tyco Electronics/AMP Netconnect; Tyco International Ltd.
- B. General Requirements for Cable Connecting Hardware: Comply with TIA/EIA-568-B.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, plus spares and blank positions adequate to suit specified expansion criteria.
- F. Jacks and Jack Assemblies: Modular, color-coded, eight-position modular receptacle units with integral IDC-type terminals.
- G. Patch Cords: Factory-made, four-pair cables in 48-inch lengths; terminated with eight-position modular plug at each end.

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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.
3. Provide one cord for each new patch panel terminal.

### 2.3 COAXIAL CABLE

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Alpha Wire Company.
  2. Belden CDT Inc.; Electronics Division.
  3. Coleman Cable, Inc.
  4. CommScope, Inc.
  5. Draka USA.
- B. Cable Characteristics: Broadband type, recommended by cable manufacturer specifically for broadband data transmission applications. Coaxial cable and accessories shall have 75-ohm nominal impedance with a return loss of 20 dB maximum from 7 to 806 MHz.
- C. RG-11/U: NFPA 70, Type CATV.
1. No. 14 AWG, solid, copper-covered steel conductor.
  2. Gas-injected, foam-PE insulation.
  3. Double shielded with 100 percent aluminum polyester tape and 60 percent aluminum braid.
  4. Jacketed with sunlight-resistant, black PVC or PE.
  5. Suitable for outdoor installations in ambient temperatures ranging from minus 40 to plus 85 deg C.
- D. RG59/U: NFPA 70, Type CATVR.
1. No. 20 AWG, solid, silver-plated, copper-covered steel conductor.
  2. Gas-injected, foam-PE insulation.
  3. Triple shielded with 100 percent aluminum polyester tape and 95 percent aluminum braid; covered by aluminum foil with grounding strip.
  4. Color-coded PVC jacket.
- E. RG-6/U: NFPA 70, Type CATV or CM.
1. No. 16 AWG, solid, copper-covered steel conductor; gas-injected, foam-PE insulation.
  2. Double shielded with 100 percent aluminum-foil shield and 60 percent aluminum braid.
  3. Jacketed with black PVC or PE.
  4. Suitable for indoor installations.
- F. RG59/U: NFPA 70, Type CATV.
1. No. 20 AWG, solid, copper-covered steel conductor; gas-injected, foam-PE insulation.
  2. Double shielded with 100 percent aluminum polyester tape and 40 percent aluminum braid.

## SECTION 271500 - COMMUNICATIONS HORIZONTAL CABLING

3. PVC jacket.

G. RG59/U (Plenum Rated): NFPA 70, Type CMP.

1. No. 20 AWG, solid, copper-covered steel conductor; foam fluorinated ethylene propylene insulation.
2. Double shielded with 100 percent aluminum-foil shield and 65 percent aluminum braid.
3. Copolymer jacket.

H. NFPA and UL compliance, listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 1655 and with NFPA 70 "Radio and Television Equipment" and "Community Antenna Television and Radio Distribution" Articles. Types are as follows:

1. CATV Cable: Type CATV.
2. CATV Plenum Rated: Type CATVP, complying with NFPA 262.
3. CATV Riser Rated: Type CATVR, complying with UL 1666.
4. CATV Limited Rating: Type CATVX.

### 2.4 COAXIAL CABLE HARDWARE

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. Aim Electronics; a brand of Emerson Electric Co.
2. Leviton Voice & Data Division.
3. Siemon Co. (The).

B. Coaxial-Cable Connectors: Type BNC, 75 ohms.

### 2.5 TELECOMMUNICATIONS OUTLET/CONNECTORS

A. Jacks: 100-ohm, balanced, twisted-pair connector; four-pair, eight-position modular. Comply with TIA/EIA-568-B.1.

B. Workstation Outlets: Four-port-connector assemblies mounted in single faceplate.

1. Plastic Faceplate: High-impact plastic. Coordinate color with Division 26 Section "Wiring Devices."
2. For use with snap-in jacks accommodating any combination of UTP and coaxial work area cords.
  - a. Flush mounting jacks, positioning the cord at a 45-degree angle.
3. Legend: Snap-in, clear-label covers and machine-printed paper inserts.

### 2.6 GROUNDING

A. Comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems" for grounding conductors and connectors.

## **SECTION 271500 - COMMUNICATIONS HORIZONTAL CABLING**

- B. Comply with ANSI-J-STD-607-A.

### **2.7 IDENTIFICATION PRODUCTS**

- A. Comply with TIA/EIA-606-A and UL 969 for labeling materials, including label stocks, laminating adhesives, and inks used by label printers.
- B. Comply with requirements in Division 26 Section "Identification for Electrical Systems."

### **2.8 SOURCE QUALITY CONTROL**

- A. Testing Agency: Engage a qualified testing agency to evaluate cables.
- B. Factory test UTP and optical fiber cables on reels according to TIA/EIA-568-B.1.
- C. Factory test UTP cables according to TIA/EIA-568-B.2.
- D. Factory test multimode optical fiber cables according to TIA/EIA-526-14-A and TIA/EIA-568-B.3.
- E. Factory-sweep test coaxial cables at frequencies from 5 MHz to 1 GHz. Sweep test shall test the frequency response, or attenuation over frequency, of a cable by generating a voltage whose frequency is varied through the specified frequency range and graphing the results.
- F. Cable will be considered defective if it does not pass tests and inspections.
- G. Prepare test and inspection reports.

## **PART 3 - EXECUTION**

### **3.1 WIRING METHODS**

- A. Wiring Method: Install cables in raceways and trays except within consoles, cabinets, desks, and counters. Conceal raceway and cables except in unfinished spaces.
  - 1. Install plenum cable in environmental air spaces, including plenum ceilings.
  - 2. Comply with requirements for raceways and boxes specified in Division 26 Section "Raceway and Boxes for Electrical Systems."
- B. Wiring Method: Conceal conductors and cables in accessible ceilings and walls where possible.
- C. Wiring within Enclosures: Bundle, lace, and train cables to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.



## SECTION 271500 - COMMUNICATIONS HORIZONTAL CABLING

### 3.2 INSTALLATION OF PATHWAYS

- A. Comply with TIA/EIA-569-A for pull-box sizing and length of conduit and number of bends between pull points.
- B. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems" for installation of conduits and wireways.
- C. Install manufactured conduit sweeps and long-radius elbows whenever possible.

### 3.3 INSTALLATION OF CABLES

- A. Comply with NECA 1.
- B. General Requirements for Cabling:
  - 1. Comply with TIA/EIA-568-B.1.
  - 2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
  - 3. Install 110-style IDC termination hardware unless otherwise indicated.
  - 4. Terminate conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
  - 5. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
  - 6. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
  - 7. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
  - 8. 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.
  - 9. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
  - 10. In the communications equipment room, install a 10-foot- long service loop on each end of cable.
  - 11. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.
- C. UTP Cable Installation:
  - 1. Comply with TIA/EIA-568-B.2.
  - 2. Do not untwist UTP cables more than 1/2 inch from the point of termination to maintain cable geometry.
- D. Open-Cable Installation:
  - 1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.

## SECTION 271500 - COMMUNICATIONS HORIZONTAL CABLING

- E. Group connecting hardware for cables into separate logical fields.
- F. Separation from EMI Sources:
  - 1. Comply with BICSI TDMM and TIA/EIA-569-A for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
  - 2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
    - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
    - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
    - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.
  - 3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
    - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
    - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
    - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.
  - 4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
    - a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
    - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
    - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.
  - 5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.
  - 6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches.

### 3.4 FIRESTOPPING

- A. Comply with requirements in Division 07 Section "Penetration Firestopping."
- B. Comply with TIA/EIA-569-A, Annex A, "Firestopping."
- C. Comply with BICSI TDMM, "Firestopping Systems" Article.

### 3.5 GROUNDING

- A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.
- B. Comply with ANSI-J-STD-607-A.

## SECTION 271500 - COMMUNICATIONS HORIZONTAL CABLING

- C. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

### 3.6 IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."
- B. Paint and label colors for equipment identification shall comply with TIA/EIA-606-A for Class 2 level of administration, including optional identification requirements of this standard.
- C. Cable Schedule: Post in prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.
- D. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, terminal hardware and positions, horizontal cables, terminal positions, grounding buses and pathways, and equipment grounding conductors. Incorporate drawings with those for the existing facility. Follow convention of TIA/EIA-606-A. Furnish electronic record of all drawings, in software and format selected by Owner.
- E. Cable and Wire Identification:
  - 1. Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
  - 2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
  - 3. Label each terminal strip and screw terminal in each cabinet, rack, or panel.
    - a. Individually number wiring conductors connected to terminal strips, and identify each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with name and number of particular device as shown.
    - b. Label each unit and field within distribution racks and frames.
  - 4. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.
- F. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA/EIA-606-A.
  - 1. Cables use flexible vinyl or polyester that flex as cables are bent.

## SECTION 271500 - COMMUNICATIONS HORIZONTAL CABLING

### 3.7 FIELD QUALITY CONTROL

#### A. Tests and Inspections:

1. Visually inspect UTP and optical fiber cable jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA/EIA-568-B.1.
2. Visually confirm Category 5e marking of outlets, cover plates, outlet/connectors, and patch panels.
3. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
4. Test UTP backbone copper cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.
  - a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.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.
5. UTP Performance Tests:
  - a. Test for each outlet. Perform the following tests according to TIA/EIA-568-B.1 and TIA/EIA-568-B.2:
    - 1) Wire map.
    - 2) Length (physical vs. electrical, and length requirements).
    - 3) Insertion loss.
    - 4) Near-end crosstalk (NEXT) loss.
    - 5) Power sum near-end crosstalk (PSNEXT) loss.
    - 6) Equal-level far-end crosstalk (ELFEXT).
    - 7) Power sum equal-level far-end crosstalk (PSELFEXT).
    - 8) Return loss.
    - 9) Propagation delay.
    - 10) Delay skew.
6. Final Verification Tests: Perform verification tests for UTP systems after the complete communications cabling and workstation outlet/connectors are installed.
  - a. Data Tests: These tests assume the Information Technology Staff has a network installed and is available to assist with testing. Connect to the network interface device at the demarcation point. Log onto the network to ensure proper connection to the network.

- B. Document data for each measurement. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.

- C. End-to-end cabling will be considered defective if it does not pass tests and inspections.

**SECTION 271500 - COMMUNICATIONS HORIZONTAL CABLING**

- D. Prepare test and inspection reports.

**END OF SECTION 271500**

## **SECTION 275116 - PUBLIC ADDRESS AND MASS NOTIFICATION 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. Recessed ceiling speakers
  - 2. Connection to and integration with the existing paging equipment.
  - 3. Interface to the existing telephone system to allow voice paging via any handset in the hospital.
  - 4. Zoning of the paging system to allow paging by department, as well as hospital wide.
  - 5. Rack mounted equipment.

#### **1.3 DEFINITIONS**

- A. Channels: Separate parallel signal paths, from sources to loudspeakers or loudspeaker zones, with separate amplification and switching that permit selection between paths for speaker alternative program signals.
- B. VU: Volume unit.
- C. Zone: Separate group of loudspeakers and associated supply wiring that may be arranged for selective switching between different channels.

#### **1.4 ACTION SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For equipment cabinets and racks, and components. Include plans, elevations, sections, details, and attachments to other work.
  - 1. Detail equipment assemblies and indicate dimensions, weights, required clearances, method of field assembly, components, and location and size of each field connection.
  - 2. Console layouts.
  - 3. Control panels.
  - 4. Rack arrangements.
  - 5. Wiring Diagrams: For power, signal, and control wiring.
    - a. Identify terminals to facilitate installation, operation, and maintenance.
    - b. Single-line diagram showing interconnection of components.

## **SECTION 275116 - PUBLIC ADDRESS AND MASS NOTIFICATION SYSTEMS**

- c. Cabling diagram showing cable routing.

### **1.5 INFORMATIONAL SUBMITTALS**

- A. Qualification Data: For qualified Installer.
- B. Field quality-control reports.

### **1.6 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: For public address and mass notification systems to include in emergency, operation, and maintenance manuals.

### **1.7 QUALITY ASSURANCE**

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
  - 1. Personnel certified by NICET as Audio Systems Level II Technician.
- B. Source Limitations: Obtain public address and mass notification systems from single source from single manufacturer.
- 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 NFPA 70.

### **1.8 COORDINATION**

- A. Coordinate layout and installation of system components and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Manufacturer: Subject to compliance with requirements, provide products by the following:
  - 1. Valcom, Inc., Multipath Intercom System

### **2.2 FUNCTIONAL DESCRIPTION OF SYSTEM**

- A. System Functions:

## **SECTION 275116 - PUBLIC ADDRESS AND MASS NOTIFICATION SYSTEMS**

1. Selectively connect any zone to any available signal channel.
2. Telephone paging adapter shall allow paging by dialing an extension from any local telephone instrument and speaking into the telephone.
3. Produce a program-signal tone that is amplified and sounded over all speakers, overriding signals currently being distributed.
4. Reproduce high-quality sound that is free of noise and distortion at all loudspeakers at all times during equipment operation including standby mode with inputs off; output free of nonuniform coverage of amplified sound.

### **2.3 GENERAL EQUIPMENT AND MATERIAL REQUIREMENTS**

- A. Compatibility of Components: Coordinate component features to form an integrated system. Match components and interconnections for optimum performance of specified functions.
- B. Equipment: Comply with UL 813. Equipment shall be modular, using solid-state components, and fully rated for continuous duty unless otherwise indicated. Select equipment for normal operation on input power usually supplied at 110 to 130 V, 60 Hz.
- C. Equipment Mounting: Where rack, cabinet, or console mounting is indicated, equipment shall be designed to mount in a 19-inch housing complying with TIA/EIA-310-D.

### **2.4 PREAMPLIFIERS**

- A. Preamplifier: Integral to power amplifier.
- B. Output Power: Plus 4 dB above 1 mW at matched power-amplifier load.
- C. Total Harmonic Distortion: Less than 1 percent.
- D. Frequency Response: Within plus or minus 2 dB from 50 to 15,000 Hz.
- E. Minimum Noise Level: Minus 55 dB below rated output.
- F. Controls: On-off, input levels, and master gain.

### **2.5 POWER AMPLIFIERS**

- A. Output Power: 70-V balanced line. 80 percent of the sum of wattage settings of connected for each station and speaker connected in all-call mode of operation, plus an allowance for future stations.
- B. Total Harmonic Distortion: Less than 3 percent at rated power output from 50 to 12,000 Hz.
- C. Minimum Signal-to-Noise Ratio: 60 dB, at rated output.
- D. Frequency Response: Within plus or minus 2 dB from 50 to 12,000 Hz.
- E. Output Regulation: Less than 2 dB from full to no load.



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- F. Controls: On-off, input levels, and low-cut filter.
- G. Input Sensitivity: Matched to preamplifier and to provide full-rated output with sound-pressure level of less than 10 dynes/sq. cm impinging on speaker microphone or handset transmitter.

### **2.6 TELEPHONE PAGING ADAPTER**

- A. Adapters shall accept voice signals from telephone extension dialing access and automatically provide amplifier input and program override for preselected zones.
  - 1. Minimum Frequency Response: Flat, 200 to 2500 Hz.
  - 2. Impedance Matching: Adapter matches telephone line to public address equipment input.

### **2.7 VOLUME LIMITER/COMPRESSOR**

- A. Minimum Performance Requirements:
  - 1. Frequency Response: 45 to 15,000 Hz, plus or minus 1 dB minimum.
  - 2. Signal Reduction Ratio: At least a 10:1 and 5:1 selectable capability.
  - 3. Distortion: 1 percent, maximum.
  - 4. Rated Output: Minimum of plus 14 dB.

### **2.8 LOUDSPEAKERS**

- A. Cone-Type Loudspeakers:
  - 1. Minimum Axial Sensitivity: 91 dB at one meter, with 1-W input.
  - 2. Frequency Response: Within plus or minus 3 dB from 50 to 15,000 Hz.
  - 3. Size: 8 inches with 1-inch voice coil and minimum 5-oz. ceramic magnet.
  - 4. Minimum Dispersion Angle: 100 degrees.
  - 5. Rated Output Level: 10 W.
  - 6. Matching Transformer: Full-power rated with four taps. Maximum insertion loss of 0.5 dB.
  - 7. Flush-Ceiling-Mounting Units: In steel back boxes, acoustically dampened. Metal ceiling grille with white baked enamel.
  - 8. Volume control.

### **2.9 CONDUCTORS AND CABLES**

- A. Jacketed, twisted pair and twisted multipair, untinned solid copper.

### **2.10 RACEWAYS**

- A. Conduit and Boxes: Comply with Division 26 Section "Raceway and Boxes for Electrical Systems." Flexible metal conduit shall not be used.

## **SECTION 275116 - PUBLIC ADDRESS AND MASS NOTIFICATION SYSTEMS**

1. Outlet boxes shall be not less than 2 inches wide, 3 inches high, and 2-1/2 inches deep.

### **PART 3 - EXECUTION**

#### **3.1 WIRING METHODS**

- A. Wiring Method: Install cables in raceways and trays except within consoles, cabinets, desks, and counters. Conceal raceway and cables except in unfinished spaces.
  1. Install plenum cable in environmental air spaces, including plenum ceilings.
  2. Comply with requirements for raceways and boxes specified in Division 26 Section "Raceway and Boxes for Electrical Systems."
- B. Wiring within Enclosures: Bundle, lace, and train cables to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

#### **3.2 INSTALLATION OF RACEWAYS**

- A. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems" for installation of conduits and wireways.
- B. Install manufactured conduit sweeps and long-radius elbows whenever possible.

#### **3.3 INSTALLATION OF CABLES**

- A. Comply with NECA 1.
- B. General Cable Installation Requirements:
  1. Terminate conductors; no cable shall contain unterminated elements. Make terminations only at outlets and terminals.
  2. Splices, Taps, and Terminations: Arrange on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures. Cables may not be spliced.
  3. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
  4. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.
  5. 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.
  6. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used.
- C. Open-Cable Installation:

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1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend speaker cable not in a wireway or pathway a minimum of 8 inches above ceiling by cable supports not more than 30 inches apart.

### **3.4 INSTALLATION**

- A. Match input and output impedances and signal levels at signal interfaces. Provide matching networks where required.
- B. Identification of Conductors and Cables: Color-code conductors and apply wire and cable marking tape to designate wires and cables so they identify media in coordination with system wiring diagrams.
- C. Equipment Cabinets:
  1. Group items of same function together, either vertically or side by side, and arrange controls symmetrically. Mount monitor panel above the amplifiers.
  2. Arrange all inputs, outputs, interconnections, and test points so they are accessible at rear of rack for maintenance and testing, with each item removable from rack without disturbing other items or connections.
  3. Blank Panels: Cover empty space in equipment racks so entire front of rack is occupied by panels.
- D. Volume Limiter/Compressor: Equip each zone with a volume limiter/compressor. Install in central equipment cabinet. Arrange to provide a constant input to power amplifiers.
- E. Conductor Sizing: Unless otherwise indicated, size speaker circuit conductors from racks to loudspeaker outlets not smaller than No. 18 AWG.
- F. Speaker-Line Matching Transformer Connections: Make initial connections using tap settings indicated on Drawings.
- G. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

### **3.5 GROUNDING**

- A. Ground cable shields and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.
- B. Signal Ground Terminal: Locate at main equipment cabinet. Isolate from power system and equipment grounding.

### **3.6 FIELD QUALITY CONTROL**

- A. Perform tests and inspections.

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### **B. Tests and Inspections:**

1. Schedule tests with at least seven days' advance notice of test performance.
2. After installing public address and mass notification systems and after electrical circuitry has been energized, test for compliance with requirements.
3. Operational Test: Perform tests that include originating program and page messages at microphone outlets, preamplifier program inputs, and other inputs. Verify proper routing and volume levels and that system is free of noise and distortion.
4. Signal-to-Noise Ratio Test: Measure signal-to-noise ratio of complete system at normal gain settings as follows:
  - a. Disconnect telephone interface at connector or jack closest to it and replace it in the circuit with a signal generator using a 1000-Hz signal. Measure signal-to-noise ratio.
  - b. Repeat test for each separately controlled zone of loudspeakers.
  - c. Minimum acceptance ratio is 50 dB.
5. Distortion Test: Measure distortion at normal gain settings and rated power. Feed signals at frequencies of 50, 200, 400, 1000, 3000, 8000, and 12,000 Hz into each preamplifier channel. For each frequency, measure distortion in the paging and all-call amplifier outputs. Maximum acceptable distortion at any frequency is 3 percent total harmonics.
6. Acoustic Coverage Test: Feed pink noise into system using octaves centered at 500 and 4000 Hz. Use sound-level meter with octave-band filters to measure level at five locations in each zone. For spaces with seated audiences, maximum permissible variation in level is plus or minus 2 dB. In addition, the levels between locations in same zone and between locations in adjacent zones must not vary more than plus or minus 3 dB.
7. Power Output Test: Measure electrical power output of each power amplifier at normal gain settings of 50, 1000, and 12,000 Hz. Maximum variation in power output at these frequencies must not exceed plus or minus 1 dB.
8. Signal Ground Test: Measure and report ground resistance at public address equipment signal ground. Comply with testing requirements specified in Division 26 Section "Grounding and Bonding for Electrical Systems."

C. Inspection: Verify that units and controls are properly labeled and interconnecting wires and terminals are identified. Prepare a list of final tap settings of paging speaker-line matching transformers.

D. Public address and mass notification systems will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

1. Include a record of final speaker-line matching transformer-tap settings, and signal ground-resistance measurement certified by Installer.

### **3.7 STARTUP SERVICE**

A. Perform startup service.

## **SECTION 275116 - PUBLIC ADDRESS AND MASS NOTIFICATION SYSTEMS**

1. Verify that electrical wiring installation complies with manufacturer's submittal and installation requirements.
2. Complete installation and startup checks according to manufacturer's written instructions.

### **3.8 ADJUSTING**

- A. On-Site Assistance: Provide on-site assistance in adjusting sound levels, resetting transformer taps, and adjusting controls to meet occupancy conditions.

### **3.9 DEMONSTRATION**

- A. Train Owner's maintenance personnel to adjust, operate, and maintain the public address and mass notification systems and equipment.

**END OF SECTION 275116**

## **SECTION 275223 - NURSE CALL 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. This section includes wire, cable, connecting devices, equipment, installation, and testing for a full-featured, microprocessor-based, audio/visual nurse call system.
- B. This system shall integrate with the system recently installed in the hospital addition.
- C. The installation involves temporary systems during construction, retaining integration with the present system and active operation of the hospital.
- D. Related sections include the following:
  - 1. Section 283111 – Digital, Addressable Fire Alarm System.
  - 2. Section 280513 – Conductors and Cables for Electronic Safety and Security.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
  - 1. Detail equipment cabinets and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 2. Cabling Diagrams: Single-line block diagrams showing cabling interconnection of all components for this specific equipment. Include cable type for each interconnection.
  - 3. Station Installation Details: For built-in equipment, dimensioned and to scale.
  - 4. Floor Plans: Indicate final outlet locations and routings of raceway connections.
  - 5. Device Address List: Coordinate with final system programming.

#### **1.4 INFORMATIONAL SUBMITTALS**

- A. Field quality-control reports.

#### **1.5 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: Updated or modified nurse-call equipment to include in the existing emergency, operation, and maintenance manuals.

## **SECTION 275223 - NURSE CALL SYSTEM**

### **1.6 QUALITY ASSURANCE**

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Electrical Components, Devices, and Accessories: Listed and labeled according to UL 1069 as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Source Limitations: Obtain nurse call system components through one source from a single manufacturer.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- E. Comply with NFPA 70.
- F. Nurse call system and equipment standards: UL Standard 1069 Hospital Signaling and Nurse Call Equipment, and Electronics Institute of America (EIA) Standards.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 1. Dukane Communications Systems ProCare 6000

### **2.2 SYSTEM OPERATIONS**

- A. General: Two-way voice communication between any base master station and its patient and staff/duty stations shall be provided with audible and visible annunciation of all calls by sixteen programmable levels of priority, dependent on assignment of base masters and stations to any one of up to eight possible Local Area Groups (LAGs).
  - 1. In addition to code blue, staff emergency, lavatory emergency, patient emergency, patient priority, cord out, patient normal, and staff normal, one of eight priority levels shall be assignable to each patient station and/or to each bed. All levels shall be indicated individually at the base master and at duty stations assigned to the same area.
  - 2. The priority level names shall be displayed as a minimum of four alpha characters, and the room numbers shall be user-programmable from three to eight digits in length.
  - 3. The room numbers shall be user-defined, being a combination of three to eight numbers and/or programmable alpha characters for room and bed designations.
  - 4. Calls shall be visibly annunciated by the station call assurance LEDs, corridor lights, and zone lights associated with each call.

## SECTION 275223 - NURSE CALL SYSTEM

- B. Corridor (dome) lights, zone dome lights, patient control devices, central equipment, power supplies, and system cabling shall be included.
- C. Failure of the intercom portion of the system shall not interfere with the visual annunciation of calls.
- D. The system shall permit the staff to hear the slightest whisper or movement of the patients.
- E. The system shall use multiplex technology, requiring no unique wiring on a per station basis.
- F. The system shall provide automatic supervision of associated patient, staff, and duty stations, couplers, and base masters, with an indication at the base master of which stations have failed.
- G. The system shall allow the staff to transfer call coverage of one or more individual stations or groups of stations from one base master to another one within the same LAG or file server without using mechanical switches or requiring additional wiring at the stations.
- H. The system's reminder feature shall be configurable by call priority level to allow any of three levels of staff reminder to be set manually by the attendant, automatically upon answering the call from the base master, or automatically when a pocket page message is placed to the assigned staff.
- I. The system shall be able to create a list of staff members, using up to 511 random 3 to 9-digit ID numbers, for the purpose of grouping them into shifts, and of assigning individual staff members to patients/beds as primary or alternate caregivers. It shall then be possible to automatically direct patient calls to the assigned staff currently on duty via a separate pocket page or wireless telephone system, thereby alerting them to the pending call.
- J. The pillow speakers and/or bed rail systems shall have the capability to control standard hospital-grade TVs and low voltage lighting.
- K. All code blue calls placed from any room shall be annunciated on centralized digital code blue display panels located in the PBX.

### 2.3 SINGLE PATIENT STATION

- A. The single patient bedside station shall contain all the necessary electrical components to support all stations within the room, including up to five lavatory stations, up to five remotely located code blue stations, up to five remotely located staff emergency stations, manual or automatic presence stations, and four-section corridor lights, to provide the following functions:
  - 1. The patient shall be able to place any one of three types of calls, as determined by the attendant at the base master, by pressing the call button on the cord set, pillow speaker, or patient station.
  - 2. A normal call shall be annunciated in these ways:
    - a. The call assurance LED on the patient station and pillow speaker shall light.
    - b. The white section of the corridor light shall light steadily.
    - c. The white section of the associated zone lights, if used, shall light steadily.



## SECTION 275223 - NURSE CALL SYSTEM

- d. The system monitor LEDs on all duty stations within the selected area of coverage shall flash at a slow rate to indicating that a normal patient call has been registered on the system.
- e. The patient's room number (up to seven digits), the bed designation (a number or one of eight programmable letter designations), and the call priority shall appear in the call window on the base master, depending on the current call queue.
  - 1) If a call of equal or higher priority is already displayed, this call and all subsequent calls shall be held in memory and not displayed until the preceding or higher priority calls are answered and cleared or set on reminder.
  - 2) The attendant shall be able to scroll the display one at a time to display any additional call and its position in the queue of calls waiting.
- f. An electronic tone shall sound at the rate and pattern programmed by the user, based on the call priority, at all base masters that cover this patient station.
- g. When the normal call is answered, all associated lights shall extinguish, the call shall be canceled, and the room and bed number shall be displayed on the base master to indicate that an audio path has been established with the patient station.
- h. The supplemental display unit, in parallel to the base master, shall display a Connect window and provide additional information regarding staff assignments and patient information, as programmed by the user.
  - 1) All calls on reminder shall be held in memory for future review by the attendant and shall only be cancelable from the patient rooms.
  - 2) Any call requests not answered within a predetermined time limit shall automatically reappear as a reminder recall at the base master.
- 3. Patient priority calls shall be the same as the normal calls except:
  - a. The white section of the corridor light and associated zone lights, if used, shall slowly flash at a rate of 15 ppm.
  - b. The call, if answered at the base master, shall either remain displayed and indicate it was answered or, if programmed to do so based on the priority level, be removed from the pending calls list and automatically placed on red, amber, green, or any combination of reminders.
  - c. It shall only be possible to cancel the call at the room.
- 4. Patient emergency calls shall be the same as patient priority calls except:
  - a. The white section of the corridor light and associated zone lights, if used, shall rapidly flash at a rate of 60 ppm.
  - b. The tone shall sound at a different rate at the base master as determined and programmed by the user.
- 5. The base master attendant, upon placing a call to a station or answering a call from a station, shall be able to communicate with the patient through the patient station's associated pillow speaker, with the base master in control of the audio direction.

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- a. A 2-1/2 inch (6.4 cm) diameter speaker/microphone shall be part of the patient station for hands-free two-way voice communications when no pillow speaker is attached or when a pushbutton or air activated call cord is used in place of a pillow speaker. The patient shall not have to direct his/her voice toward the station panel or operate any controls.
  - b. When a pillow speaker is used, communications shall automatically occur through the pillow speaker instead of the station speaker. Furthermore, during communications, entertainment audio (TV) shall temporarily be suspended, and the volume control shall be removed from audio circuitry.
  - c. Any time communication is established, an alert tone shall sound and the privacy LED on the patient station and the pillow speaker shall light and remain lit until communication is discontinued.
  - d. Accidental or intentional removal of the cord set or pillow speaker from its receptacle shall place a "cord out" call in the same manner as a patient (bed) priority call. This call shall appear on the base master display in relative order to other priorities, and communications shall automatically transfer to the patient station wall speaker.
6. The SECRECY button, when momentarily pressed, shall light its LED and prevent the base master attendant from overhearing conversation in the patient's room when the base master places a call to the room. Secrecy functions programmed or released from the base master shall not be acceptable.
  - a. When a base master places a call to a station that has the secrecy function activated, a secrecy indication shall appear in the base master window and in the Connect window of the supplemental display, if present.
  - b. The secrecy mode shall be temporarily suspended, allowing the attendant to converse with the patient, by the patient momentarily pressing the CALL button. Once the call has been disconnected, the secrecy mode shall automatically be reinstated.
  - c. If the patient places a call, the secrecy mode shall automatically suspend for the duration of the call, allowing the base master attendant to answer the call and establish two-way voice communication with the patient without the patient having to press the CALL button again.
  - d. The secrecy function shall be deactivated by pressing the SECRECY button again, causing the LED to turn off.
7. The CANCEL button, when momentarily pressed, shall cancel any type of call placed from the patient station and/or cancel any level of reminder. The LED associated with the CANCEL button shall light any time the station is being monitored by, or is in communication with, the base master.
8. The SYSTEM MONITOR button and LED shall be provided at each patient and staff station. Whenever a staff member enters the room and presses the button, the LED shall steadily illuminate to indicate the system monitor function has been activated.
  - a. If a call is placed within the station's area of coverage as configured by the user and based on staff assignments, duty area, or base master coverage, the LED shall flash and a tone shall sound at a rate determined by the priority of the call placed.

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- b. If a call is placed from the lavatory station in the same room, a distinctive tone shall sound at the room's patient station only, taking priority over any other call placed from that room.
  - c. The red section of the corridor light shall steadily illuminate and the red staff presence shall be registered into the system for query and to display the staff member's location at the base master.
- 9. Staff emergency calls shall be placed from the patient station by momentarily pressing the green STAFF EMERGENCY button. This call shall temporarily suspend, but not cancel, any lower priority call already placed from the room. Systems requiring a separate station to perform this function shall not be acceptable.
  - a. When a staff member is registered in the room by a manual or automatic presence station or through the system monitor function, the system shall also allow a staff emergency call to be placed by pressing the call button on the cord set or pillow speaker two times in rapid succession.
  - b. The staff emergency call shall automatically and simultaneously perform the following functions:
    - 1) Flash the green section of the corridor light at a rate of 60 ppm.
    - 2) Sound a repetitive electronic tone at a rate of 60 ppm at all duty stations, and at the base master at a rate and pattern determined by the user for the area of coverage.
    - 3) Flash the green section of all associated zone lights, if used, at a rate of 60 ppm.
    - 4) Flash the system monitor LED on all duty stations at a rate of 60 ppm.
    - 5) Display the patient's room and bed number, followed by the call priority, on the base master display in relative order to other priorities as configured by the user.
    - 6) If the call is answered from the base master it shall either remain displayed and indicate it was answered or, if programmed to do so based on the priority level, be removed from the pending calls list and automatically placed on red, amber, green, or any combination of reminders.
    - 7) It shall only be possible to cancel the staff emergency call and the reminder, if set, from the station that placed the call.
- 10. Code blue calls shall be placed from any patient room by momentarily pressing the blue CODE BLUE button on the patient station. Systems requiring a separate station to perform this function shall not be acceptable.
  - a. Placing a code blue call shall perform the same functions as the staff emergency call, except:
    - 1) The amber section of the corridor light shall flash at a rate of 60 ppm.
    - 2) A repetitive electronic tone shall sound at a rate of 240 ppm at all duty stations, and at the base master at a rate and pattern determined by the user for the area of coverage.
    - 3) The amber section of all associated zone lights, if used, shall flash at a rate of 60 ppm.

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11. A call button shall be provided on the station to allow placement of normal calls in parallel with or in the absence of a call cord or pillow speaker.
  12. A receptacle shall be provided for plug-in connection of a pushbutton or air activated call cord, or a pillow speaker for two-way communications with the base master and control of the entertainment (TV) audio and station selection. When both pillow speaker and air activated call cord are required for simultaneous use, an adapter shall be provided.
  13. A smoke detector, having maintained normally open dry contacts, shall be connected to the patient station's room auxiliary and shall provide a secondary alarm through the nurse call system. The device shall also be connected to its primary system for which it was designed and for its intended use per all existing codes.
    - a. When in alarm mode, the device shall activate the (supervised fire alarm system) primary system alarm panels and automatically place a call in the system.
    - b. The patient's room and bed number, followed by the call priority (or device name), shall appear on the base master display in relative order to other priorities as configured by the user.
    - c. The corridor lights and associated zone lights shall sequentially flash red, amber, green, and the duty stations shall tone the same as the code blue priority.
- B. The Hill-Rom bed rail communications system shall be furnished in each patient room, to be used for nurse call functions and two-way audio communications.
1. Provide the 8-foot (2.4 m) interconnecting cable for each bed between the patient station and the bed receptacle mounted near the baseboard of the headwall.
  2. A low voltage lighting control and separate power source, if required, shall be supplied, and shall provide 12 to 24Vdc without exceeding 750mA control to a designated button on the pillow speaker or bed rail system, for sequential operation of the lights: 1on/2off, 2on/1off, 1on/2on, 1off/2off.

### 2.4 LAVATORY EMERGENCY STATIONS

- A. The lavatory emergency station shall be provided in a pull cord version, equipped with a CANCEL button and call assurance LED, all mounted on a single-gang, non-conductive chassis. When a call is placed from this station, the following shall occur:
1. The station's LED shall light to indicate that the call has been placed.
  2. The red section of the corridor light associated with the room shall flash at a rate of 60 ppm.
  3. The red section of all associated zone lights shall flash at a rate of 60 ppm.
  4. The system monitor LED shall flash on duty stations at a rate of 60 ppm.
  5. The tones shall sound at the base master and all associated duty stations at a rate of 60 ppm, and continue to sound until the call is canceled by momentarily pressing the CANCEL button on the station that placed the call.
- B. The room number and programmed priority shall be displayed at the base master. When associated with a patient station, this call may be acknowledged in the same manner as answering any other priority call, and shall automatically be placed on reminder or remain in the pending calls queue, if programmed to do so, until canceled at the station that placed the call.

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### **2.5 STAFF/DUTY STATION**

- A. 1. The staff/duty station shall be located in non-patient rooms where staff members normally perform their duties, and when shown on the floor plans, shall also be located inside the entrance of each patient's room. The station shall be physically and electronically similar to the patient station except no call cord receptacle shall be provided.
- B. A staff call shall be placed by momentarily pressing the CALL button, causing the following to occur:
  - 1. The LED associated with the button shall steadily illuminate.
  - 2. The white section of the corridor light shall steadily illuminate.
  - 3. The white section of all associated zone lights shall steadily illuminate.
  - 4. The tone at the base master shall sound at a rate of 7.5 ppm.
  - 5. The room number, followed by the priority name, shall appear in the base master window, depending on the quantity of equal or higher priority calls already placed.
- C. The SECRECY, STAFF EMERGENCY, CODE BLUE, and CANCEL buttons, along with their associated LEDs, shall be provided and shall function in the same manner as on the patient station.
- D. A SYSTEM MONITOR button and LED shall be provided at each staff station. Whenever a staff member enters the room the button may be pressed.
  - 1. If a call is placed within the station's area of coverage, the LED shall flash and a tone shall sound at a rate determined by the priority of the call placed.
  - 2. The station shall be programmed during installation to permanently activate the system monitor function when the station is located in a staff work area requiring the staff to be visibly and audibly alerted when a patient needs assistance, and to be notified whether or not the calls are currently being answered at the base master.
  - 3. When momentarily pressed, the CANCEL button shall flash and temporarily silence the tone generated by the current pending call. The tone shall resume when an additional call is placed on the system. The station shall be equipped with an internal potentiometer to preadjust the tone volume.
- E. If required, three additional color-coded (red, amber, green), pressure-sensitive membrane buttons with LEDs shall be included as part of the control panel, replacing the SYSTEM MONITOR button but retaining the functionality of the operation.
  - 1. If the staff member is responding to a patient's request, the equal level service request (reminder) and the "overtime recall" function shall be canceled from system memory.

### **2.6 CORRIDOR LIGHTS**

- A. Multisection corridor lights, suitable for wall or ceiling mounting, shall be provided outside the entrance to each patient room and all staff/duty rooms, clearly visible from all directions.

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- B. The chassis, similar in design and material to the patient station, shall accommodate one, two, three, or four long-life, color-coded lamps, separated by snap-in metal barriers, to meet the functional requirements of each room.
- C. Each colored lamp shall function as follows:
  - 1. Red (Nurse) Presence—steady red
  - 2. Amber (LPN) Presence—steady amber
  - 3. Green (Aide) Presence—steady green
  - 4. Red Required (reminder)—15 ppm flashing red
  - 5. Amber Required (reminder)—15 ppm flashing amber
  - 6. Green Required (reminder)—15 ppm flashing green
  - 7. Normal Patient Call—steady white
  - 8. Bed Auxiliary (programmable)—steady white
  - 9. Priority Patient Call—15 ppm flashing white
  - 10. Bed Auxiliary (programmable)—15 ppm flashing white
  - 11. Bed Auxiliary (programmable)—15 ppm flashing white
  - 12. Bed Auxiliary (programmable)—15 ppm flashing white
  - 13. Emergency Patient Call—60 ppm flashing white
  - 14. Bed Auxiliary (programmable)—60 ppm flashing white
  - 15. Bed Auxiliary (programmable)—60 ppm flashing white
  - 16. Bed Auxiliary (programmable)—60 ppm flashing white
  - 17. Lavatory Call—60 ppm flashing red
  - 18. Staff Emergency Call—60 ppm flashing green
  - 19. Code Blue Call—60 ppm flashing amber
  - 20. Room Auxiliary—strobe red, amber, green
- D. The single-piece lens, suitable for room number designations, shall snap onto the chassis, allowing quick and easy lamp replacement without the use of any tools.

### 2.7 ZONE LIGHTS

- A. Zone lights shall be provided at corridor intersections or as shown on the floor plans.
- B. The four sections shall be programmed to duplicate all the lighting functions of its associated room corridor lights.
- C. The single-piece lens, suitable for zone number designations, shall snap onto the chassis, allowing quick and easy lamp replacement without the use of any tools.

### 2.8 CODE BLUE STATIONS

- A. Code blue stations shall be provided as shown on the floor plans for all critical care areas where patient or staff/duty intercommunication stations normally including the CODE BLUE call functional button are not located. The single-gang, non-conductive station shall contain a blue, 1-inch (2.5 cm) square CODE BLUE (call) button and a CANCEL button with call assurance LED similar in design to the lavatory/emergency station.

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- B. When the CODE BLUE button is pressed, the LED shall illuminate to indicate that a call has been placed.
- C. The associated amber section of the corridor light shall flash at a rate of 60 ppm.
- D. All associated zone lights, if used, shall flash the amber section at a rate of 60 ppm.
- E. The system monitor LED on all duty stations within the zone shall flash at a rate of 60 ppm, and the tones at the master and duty stations shall sound at a rate of 240 ppm, until the call is canceled by momentarily pressing the CANCEL button on the station that placed the call.
- F. The room and bed number, followed by the call priority, shall appear on the base master's display in relative order to other priorities as configured by the user.
- G. If the call is acknowledged at the base master by pressing the \*ANS button, it shall either remain displayed on the pending call list and/or, if programmed, shall automatically be placed on reminder. It shall only be possible to cancel the call and reminder from the station that placed the call.
- H. The station shall have the capability to start a local elapsed timer when a call is placed.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION**

- A. Equipment:
  - 1. Stations: Mount flush in recessed back boxes.
  - 2. Control Panels and Power Supplies: Surface mount with tops of cabinets not more than 72 inches above the finished floor.
- B. Wiring Method:
  - 1. Install cables in raceways and trays except within consoles, cabinets, desks, and counters.
    - a. Conceal raceway and cables except in unfinished spaces.
  - 2. Cable Trays: Comply with requirements in Division 27 Section "Communications Horizontal Cabling."
  - 3. Conduit and Boxes: Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems."
    - a. 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.
- C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

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- D. Splices, Taps, and Terminations: Make splices, taps, and terminations on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures. Install terminal cabinets where there are splices, taps, or terminations for eight or more conductors.
- E. Impedance and Level Matching: Carefully match input and output impedances and signal levels at signal interfaces. Provide matching networks if required.
- F. Identification of Conductors and Cables: Comply with requirements in Division 27 Section "Communications Horizontal Cabling" and Division 28 Section "Conductors and Cables for Electronic Safety and Security" for cable administration, cable schedule, and cable and wire identification.
- G. Equipment Identification:
  - 1. Comply with requirements in Division 26 Section "Identification for Electrical Systems" for equipment labels and signs and labeling installation requirements.
  - 2. Label stations, controls, and indications using approved consistent nomenclature.

### **3.2 GROUNDING**

- A. Ground cable shields and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other signal impairments.
- B. Signal Ground Terminal: Locate at main equipment cabinet. Isolate from power system and equipment grounding except at connection to main building ground bus.
- C. Grounding Provisions: Comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems."

### **3.3 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. Tests and Inspections:
  - 1. Schedule tests a minimum of seven days in advance.
  - 2. Report: Submit a written record of test results.
  - 3. Operational Test: Perform an operational system test and demonstrate proper operations, adjustment, and sensitivity of each station. Perform tests that include originating station-to-station and "All Call" messages and pages at each nurse-call station. Verify proper routing, volume levels, and freedom from noise and distortion. Test each available message path from each station on the system. Meet the following criteria:
- C. Minimum System Tests: Minimum required tests are as follows:
  - 1. Verify the absence of unwanted voltages between circuit conductors and ground.
  - 2. Test all conductors for short circuits using an insulation-testing device.



## **SECTION 275223 - NURSE CALL SYSTEM**

3. Verify that the control unit is in the normal condition as detailed in the manufacturer's operation and maintenance manual.
  4. Test the system for all specified functions according to the approved operation and maintenance manual. Systematically initiate specified functional performance items at each station, including making all possible alarm and monitoring initiations and using all communications options. For each item, observe related performance at all devices required to be affected by the item under all system sequences. Observe indicating lights, displays, signal tones, and annunciator indications. Observe all voice audio for routing, clarity, quality, freedom from noise and distortion, and proper volume level.
- D. Retesting: Rectify deficiencies indicated by tests and completely retest work affected by such deficiencies at Contractor's expense. Verify, by the system test, that the total system meets these Specifications and complies with applicable standards. Report results in writing.
- E. Inspection: Verify that units and controls are properly labeled and interconnecting wires and terminals are identified.
- F. Prepare test and inspection reports.

### **3.4 DEMONSTRATION**

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel and caregiver staff to adjust, operate, and maintain nurse-call equipment.

**END OF SECTION 275223**

## **SECTION 280513 - CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY**

### **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. RS-232 cabling.
  - 2. RS-485 cabling.
  - 3. Low-voltage control cabling.
  - 4. Control-circuit conductors.
  - 5. Fire alarm wire and cable.
  - 6. Identification products.

#### **1.3 DEFINITIONS**

- A. BICSI: Building Industry Consulting Service International.
- B. EMI: Electromagnetic interference.
- C. IDC: Insulation displacement connector.
- D. 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.
- E. Open Cabling: Passing telecommunications cabling through open space (e.g., between the studs of a wall cavity).
- F. RCDD: Registered Communications Distribution Designer.

#### **1.4 ACTION SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Source quality-control reports.
- C. Field quality-control reports.

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### **1.5 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: For wire and cable to include in operation and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
  - 1. Allowable pulling tension of cable.
  - 2. Cable connectors and terminations recommended by the manufacturer.

### **1.6 QUALITY ASSURANCE**

- A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Flame-Spread Index: 25 or less.
  - 2. Smoke-Developed Index: 50 or less.
- 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.

### **1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Test cables upon receipt at Project site.
  - 1. Test each pair of cable for open and short circuits.

### **1.8 PROJECT CONDITIONS**

- A. Do not install conductors and cables that are wet, moisture damaged, or mold damaged.
  - 1. Indications that wire and cables are wet or moisture damaged include, but are not limited to, discoloration and sagging of factory packing materials.
- B. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

## **PART 2 - PRODUCTS**

### **2.1 PATHWAYS**

- A. Support of Open Cabling: NRTL labeled for support of cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.

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1. Support brackets with cable tie slots for fastening cable ties to brackets.
  2. Lacing bars, spools, J-hooks, and D-rings.
  3. Straps and other devices.
- B. Conduit and Boxes: Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems." Flexible metal conduit shall not be used.
- C. Outlet boxes shall be no smaller than 2 inches wide, 3 inches high, and 2-1/2 inches deep.

### **2.2 BACKBOARDS**

- A. Backboards: Plywood, 3/4 by 48 by 96 inches. Comply with requirements for plywood backing panels in Division 06 Section "Rough Carpentry".

### **2.3 LOW-VOLTAGE CONTROL CABLE**

- A. Paired Cable: NFPA 70, Type CMG.
1. 1 pair, twisted, No. 16 AWG, stranded (19x29 tinned copper conductors).
  2. PVC insulation.
  3. Unshielded.
  4. PVC jacket.
  5. Flame Resistance: Comply with UL 1581.
- B. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.
1. 1 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.

### **2.4 CONTROL-CIRCUIT CONDUCTORS**

- A. Class 1 Control Circuits: Stranded copper, Type THHN-THWN, complying with UL 83, in raceway.
- B. Class 2 Control Circuits: Stranded copper, Type THHN-THWN, complying with UL 83, in raceway.
- C. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type TW or TF, complying with UL 83.

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### **2.5 FIRE ALARM WIRE AND CABLE**

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Comtran Corporation.
  - 2. Draka Cableteq USA.
  - 3. Genesis Cable Products; Honeywell International, Inc.
  - 4. Rockbestos-Suprenant Cable Corp.
  - 5. West Penn Wire; a brand of Belden Inc.
- B. General Wire and Cable Requirements: NRTL listed and labeled as complying with NFPA 70, Article 760.
- C. Signaling Line Circuits: Twisted, shielded pair, not less than No.18 AWG size as recommended by system manufacturer.
  - 1. Circuit Integrity Cable: Twisted shielded pair, NFPA 70, Article 760, Classification CI, for power-limited fire alarm signal service Type FPL. NRTL listed and labeled as complying with UL 1424 and UL 2196 for a 2-hour rating.
- D. Non-Power-Limited Circuits: Solid-copper conductors with 600-V rated, 75 deg C, color-coded insulation.
  - 1. Low-Voltage Circuits: No. 16 AWG, minimum.
  - 2. Line-Voltage Circuits: No. 12 AWG, minimum.

### **2.6 IDENTIFICATION PRODUCTS**

- 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.
  - 2. HellermannTyton.
  - 3. Kroy LLC.
  - 4. PANDUIT CORP.
- B. Comply with UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.
- C. Comply with requirements in Division 26 Section "Identification for Electrical Systems."

### **2.7 SOURCE QUALITY CONTROL**

- A. Cable will be considered defective if it does not pass tests and inspections.
- B. Prepare test and inspection reports.

## **SECTION 280513 - CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY**

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION OF PATHWAYS**

- A. Comply with TIA-569-B for pull-box sizing and length of conduit and number of bends between pull points.
- B. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems." for installation of conduits and wireways.
- C. Install manufactured conduit sweeps and long-radius elbows whenever possible.

#### **3.2 INSTALLATION OF HANGERS AND SUPPORTS**

- A. Comply with requirements in Division 26 Section "Hangers and Supports for Electrical Systems." for installation of supports for pathways, conductors and cables.

#### **3.3 WIRING METHOD**

- A. Install wiring in metal raceways and wireways. Conceal raceway except in unfinished spaces and as indicated. Minimum conduit size shall be **3/4 inch**. Control and data transmission wiring shall not share conduit with other building wiring systems.
- B. 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.

#### **3.4 INSTALLATION OF CONDUCTORS AND CABLES**

- A. Comply with NECA 1.
- B. Conductors: Size according to system manufacturer's written instructions unless otherwise indicated.
- C. General Requirements for Cabling:
  - 1. Comply with TIA/EIA-568-B.1.
  - 2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
  - 3. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels.

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4. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
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 ITSIM, "Cabling Termination Practices" Chapter. 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. Heat lamps shall not be used for heating.
8. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.

### **D. Separation from EMI Sources:**

1. Comply with BICSI TDMM and TIA-569-B recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
  - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
  - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
  - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.
3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
  - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
  - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
  - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.
4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
  - a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
  - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
  - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.
5. Separation between Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.
6. Separation between Cables and Fluorescent Fixtures: A minimum of 5 inches.

### **3.5 FIRE ALARM WIRING INSTALLATION**

- A. Comply with NECA 1 and NFPA 72.

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- B. Wiring Method: Install wiring in metal raceway according to Division 26 Section "Raceway and Boxes for Electrical Systems."
  - 1. Cables and raceways used for fire alarm circuits, and equipment control wiring associated with the fire alarm system, may not contain any other wire or cable.
  - 2. Signaling Line Circuits: Power-limited fire alarm cables may be installed in the same cable or raceway as signaling line circuits.
- C. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.
- D. Cable Taps: Use numbered terminal strips in junction, pull, and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.
- E. Color-Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and another for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire alarm system junction boxes and covers red.

### **3.6 POWER AND CONTROL-CIRCUIT CONDUCTORS**

- A. 120-V Power Wiring: Install according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables" unless otherwise indicated.
- B. 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.

### **3.7 CONNECTIONS**

- A. Comply with requirements in Division 28 Section "Digital Addressable Fire-Alarm System" for connecting, terminating, and identifying wires and cables.

### **3.8 FIRESTOPPING**

- A. Comply with requirements in Division 07 Section "Penetration Firestopping."
- B. Comply with TIA-569-B, "Firestopping" Annex A.



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- C. Comply with BICSI TDMM, "Firestopping Systems" Article.

### **3.9 GROUNDING**

- A. For communications wiring, comply with ANSI-J-STD-607-A and with BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.
- B. For low-voltage wiring and cabling, comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems."

### **3.10 IDENTIFICATION**

- A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

### **3.11 FIELD QUALITY CONTROL**

- A. Perform tests and inspections.
- B. Tests and Inspections:
  - 1. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
  - 2. Test cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross connection.
    - a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
- C. 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.
- D. End-to-end cabling will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

**END OF SECTION 280513**

## **SECTION 283111 - DIGITAL, 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:
  - 1. Manual fire-alarm boxes.
  - 2. System smoke detectors.
  - 3. Heat detectors.
  - 4. Notification appliances.
  - 5. Magnetic door holders.
  - 6. Addressable interface device.

#### **1.3 DEFINITIONS**

- A. LED: Light-emitting diode.
- B. NICET: National Institute for Certification in Engineering Technologies.

#### **1.4 SYSTEM DESCRIPTION**

- A. Noncoded addressable system, with automatic sensitivity control of certain smoke detectors and multiplexed signal transmission, dedicated to fire-alarm service only.

#### **1.5 ACTION SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For fire-alarm system. Include plans, elevations, sections, details, and attachments to other work.
  - 1. Comply with recommendations in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72.
  - 2. Include voltage drop calculations for notification appliance circuits.
  - 3. Include battery-size calculations.
  - 4. Include performance parameters and installation details for each detector, verifying that each detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
  - 5. Include plans, sections, and elevations of heating, ventilating, and air-conditioning ducts, drawn to scale and coordinating installation of duct smoke detectors and access to them.

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Show critical dimensions that relate to placement and support of sampling tubes, detector housing, and remote status and alarm indicators. Locate detectors according to manufacturer's written recommendations.

6. Include voice/alarm signaling-service equipment rack or console layout, grounding schematic, amplifier power calculation, and single-line connection diagram.
7. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits.

### **C. General Submittal Requirements:**

1. Submittals shall be approved by authorities having jurisdiction prior to submitting them to Architect.
2. Shop Drawings shall be prepared by persons with the following qualifications:
  - a. Trained and certified by manufacturer in fire-alarm system design.
  - b. NICET-certified fire-alarm technician, Level IV minimum.
  - c. Licensed or certified by authorities having jurisdiction.

## **1.6 INFORMATIONAL SUBMITTALS**

- A. Qualification Data: For qualified Installer.
- B. Field quality-control reports.

## **1.7 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include updated or modified documents of the following:
  1. Comply with the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
  2. Provide "Record of Completion Documents" according to NFPA 72 article "Permanent Records" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter.
  3. Record copy of site-specific software.
  4. Provide "Maintenance, Inspection and Testing Records" according to NFPA 72 article of the same name and include the following:
    - a. Frequency of testing of installed components.
    - b. Frequency of inspection of installed components.
    - c. Requirements and recommendations related to results of maintenance.
    - d. Manufacturer's user training manuals.
  5. Manufacturer's required maintenance related to system warranty requirements.
  6. AutoCad (Release 2010) copy of the graphic annunciator display.
- B. Software and Firmware Operational Documentation:

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1. Software operating and upgrade manuals.
2. Program Software Backup: On magnetic media or compact disk, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.

### **1.8 QUALITY ASSURANCE**

- A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.
- B. Installer Qualifications: Installation shall be by personnel certified by NICET as fire-alarm Level IV technician.
- C. Source Limitations for Fire-Alarm System and Components: Obtain fire-alarm system from single source from single manufacturer. Components shall be compatible with, and operate as, an extension of existing system.
- 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. NFPA Certification: Obtain certification according to NFPA 72 by an NRTL.

### **1.9 PROJECT CONDITIONS**

- A. Interruption of Existing Fire-Alarm Service: Do not interrupt fire-alarm service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary guard service according to requirements indicated:
  1. Notify Architect no fewer than five days in advance of proposed interruption of fire-alarm service.
  2. Do not proceed with interruption of fire-alarm service without Architect's written permission.

### **1.10 SOFTWARE SERVICE AGREEMENT**

- A. Comply with UL 864.
- B. Technical Support: Beginning with Substantial Completion, provide software support for two years.
- C. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within two 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 30 days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

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### **PART 2 - PRODUCTS**

#### **2.1 MANUFACTURERS**

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product by the following:
1. SimplexGrinnell LP; a Tyco International company.

#### **2.2 MANUAL FIRE-ALARM BOXES**

- A. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38. Boxes shall be finished in red with molded, raised-letter operating instructions in contrasting color; shall show visible indication of operation; and shall be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.
1. Single-action mechanism, pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
  2. Station Reset: Key- or wrench-operated switch.
  3. Indoor Protective Shield: Factory-fabricated clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm. Lifting the cover actuates an integral battery-powered audible horn intended to discourage false-alarm operation.

#### **2.3 SYSTEM SMOKE DETECTORS**

- A. General Requirements for System Smoke Detectors:
1. Comply with UL 268; operating at 24-V dc, nominal.
  2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
  3. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring. Provide relays where required to interface with the Nurse Call System and HVAC.
  4. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
  5. Integral Visual-Indicating Light: LED type indicating detector has operated.
  6. Remote Control: Unless otherwise indicated, detectors shall be analog-addressable type, individually monitored at fire-alarm control unit for calibration, sensitivity, and alarm condition and individually adjustable for sensitivity by fire-alarm control unit.
    - a. Rate-of-rise temperature characteristic shall be selectable at fire-alarm control unit for 15 or 20 deg F per minute.
    - b. Fixed-temperature sensing shall be independent of rate-of-rise sensing and shall be settable at fire-alarm control unit to operate at 135 or 155 deg F.
    - c. Provide multiple levels of detection sensitivity for each sensor.
- B. Photoelectric Smoke Detectors:

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1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
  - a. Primary status.
  - b. Device type.
  - c. Present average value.
  - d. Present sensitivity selected.
  - e. Sensor range (normal, dirty, etc.).

### **C. Ionization Smoke Detector:**

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
  - a. Primary status.
  - b. Device type.
  - c. Present average value.
  - d. Present sensitivity selected.
  - e. Sensor range (normal, dirty, etc.).

### **D. Duct Smoke Detectors: Photoelectric type complying with UL 268A.**

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
  - a. Primary status.
  - b. Device type.
  - c. Present average value.
  - d. Present sensitivity selected.
  - e. Sensor range (normal, dirty, etc.).
3. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with the supplied detector.
4. Each sensor shall have multiple levels of detection sensitivity.
5. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
6. Relay Fan Shutdown: Rated to interrupt fan motor-control circuit.

## **2.4 HEAT DETECTORS**

- A. General Requirements for Heat Detectors: Comply with UL 521.
- B. Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 deg For a rate of rise that exceeds 15 deg F per minute unless otherwise indicated.

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1. Mounting: Twist-lock base interchangeable with smoke-detector bases.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

### **2.5 NOTIFICATION APPLIANCES**

- A. General Requirements for Notification Appliances: Connected to notification appliance signal circuits, zoned as indicated, equipped for mounting as indicated and with screw terminals for system connections.
  1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly, equipped for mounting as indicated and with screw terminals for system connections.
- B. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Comply with UL 464. Horns shall produce a sound-pressure level of 90 dBA, measured 10 feet from the horn, using the coded signal prescribed in UL 464 test protocol.
- C. Visible Notification Appliances: Xenon strobe lights comply with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- high letters on the lens.
  1. Rated Light Output:
    - a. 15/30/75/110 cd, selectable in the field.
  2. Mounting: Wall mounted, unless otherwise indicated.
  3. Flashing shall be in a temporal pattern, synchronized with other units.
  4. Strobe Leads: Factory connected to screw terminals.
  5. Mounting Faceplate: Factory finished, red.
- D. Voice/Tone Notification Appliances:
  1. Appliances shall comply with UL 1480 and shall be listed and labeled by an NRTL.
  2. High-Range Units: Rated 2 to 15 W.
  3. Low-Range Units: Rated 1 to 2 W.
  4. Mounting: Flush.
  5. Matching Transformers: Tap range matched to acoustical environment of speaker location.

### **2.6 MAGNETIC DOOR HOLDERS**

- A. Description: Units are equipped for wall or floor mounting as indicated and are complete with matching doorplate.
  1. Electromagnet: Requires no more than 3 W to develop 25-lbf holding force.
  2. Wall-Mounted Units: Flush mounted unless otherwise indicated.
  3. Rating: 24-V ac or dc.

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- B. Material and Finish: Match door hardware.

### **2.7 REMOTE ANNUNCIATOR**

- A. Graphic Display Type: Replace graphics on two existing displays utilizing the project floor plans. Coordinate layout with the Owner.

### **2.8 ADDRESSABLE INTERFACE DEVICE**

- A. Description: Microelectronic monitor module, NRTL listed for use in providing a system address for alarm-initiating devices for wired applications with normally open contacts.
- B. Integral Relay: Capable of providing a direct signal.

## **PART 3 - EXECUTION**

### **3.1 EQUIPMENT INSTALLATION**

- A. Comply with NFPA 72 for installation of fire-alarm equipment.
- B. Connecting to Existing Equipment: Verify that existing fire-alarm system is operational before making changes or connections.
  - 1. Connect new equipment to existing control panel in existing part of the building.
  - 2. Expand, modify, and supplement existing equipment as necessary to extend existing functions to the new points. New components shall be capable of merging with existing configuration without degrading the performance of either system.
- C. Smoke- or Heat-Detector Spacing:
  - 1. Comply with NFPA 72, "Smoke-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for smoke-detector spacing.
  - 2. Comply with NFPA 72, "Heat-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for heat-detector spacing.
  - 3. Smooth ceiling spacing shall not exceed 30 feet.
  - 4. Spacing of detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas shall be determined according to Appendix A in NFPA 72.
  - 5. HVAC: Locate detectors not closer than 3 feet from air-supply diffuser or return-air opening.
  - 6. Lighting Fixtures: Locate detectors not closer than 12 inches from any part of a lighting fixture.
- D. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct.
- E. Remote Status and Alarm Indicators: Install near each smoke detector that is not readily visible from normal viewing position.



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- F. Audible Alarm-Indicating Devices: Install not less than 6 inches below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille.
- G. Visible Alarm-Indicating Devices: Install adjacent to each alarm horn and at least 6 inches below the ceiling, or with each voice/tone speaker on the ceiling.
- H. Device Location-Indicating Lights: Locate in public space near the device they monitor.

### **3.2 CONNECTIONS**

- A. For fire-protection systems related to doors in fire-rated walls and partitions and to doors in smoke partitions, comply with requirements in Division 08 Section "Door Hardware." Connect hardware and devices to fire-alarm system.
  - 1. Verify that hardware and devices are NRTL listed for use with fire-alarm system in this Section before making connections.
- B. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 3 feet from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.
  - 1. Smoke dampers in air ducts of designated ventilation duct systems.

### **3.3 IDENTIFICATION**

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

### **3.4 GROUNDING**

- A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.

### **3.5 FIELD QUALITY CONTROL**

- A. Field tests shall be witnessed by Architect and authorities having jurisdiction.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- C. Tests and Inspections:
  - 1. Visual Inspection: Conduct visual inspection prior to testing.

- a. Inspection shall be based on completed Record Drawings and system documentation that is required by NFPA 72 in its "Completion Documents,

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Preparation" Table in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter.

- b. Comply with "Visual Inspection Frequencies" Table in the "Inspection" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.
  2. System Testing: Comply with "Test Methods" Table in the "Testing" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
  3. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.
  4. Test audible appliances for the private operating mode according to manufacturer's written instructions.
  5. Test visible appliances for the public operating mode according to manufacturer's written instructions.
  6. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72. Acceptable operation of each device shall be individually identified, as well as all acceptable responses of interactive devices. The report shall be typed or electronically produced.
- D. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.
- E. Fire-alarm system will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.

### **3.6 DEMONSTRATION**

- A. Train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system.

**END OF SECTION 283111**