

SECTION 15110/VALVES1 GENERAL

- 1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to the work of this section.
- 1.2 This section is a Division-15 Basic Materials and Methods section, and is part of each Division-15 section making reference to or requiring valves specified herein.
- 1.3 Extent of valves required by this section is indicated on drawings and/or specified in other Division-15 sections.
- 1.4 Quality Assurance:
  - 1.4.1 Valve Dimensions: For face-to-face and end-to-end dimensions of flanged or welding-end valve bodies, comply with ANSI B16.10.
  - 1.4.2 Valve Types: Provide valves of same type by same manufacturer.
  - 1.4.3 Valve Listing: For valves on fire protection piping, provide UL listing.
- 1.5 Approval Submittals: When required by other Division-15 sections, submit product data, catalog cuts, specifications, and dimensioned drawings for each type of valve. Include pressure drop curve or chart for each type and size of valve. Submit valves with Division-15 section using the valves, not as a separate submittal. For each valve, identify systems where the valve is intended for use.
  - 1.5.1 Check Valves. Type CK.
  - 1.5.2 Ball Valves. Type BA.
- 1.6 O&M Data Submittals: Submit a copy of approval submittals. Submit installation instructions, maintenance data and spare parts lists for each type of valve. Include this data in the O&M Manual.

2 PRODUCTS

- 2.1 General: Provide factory-fabricated valves recommended by manufacturer for use in service indicated. Provide valves of types and pressure ratings indicated; provide proper selection as determined by Installer to comply with specifications and installation requirements. Provide sizes as indicated, and connections which properly mate with pipe, tube, and equipment connections.
- 2.2 Acceptable Manufacturers: Subject to compliance with requirements, provide valves of one of the producers listed for each valve type. The model numbers are listed for contractor's convenience only. In the case of a model number discrepancy, the written description shall govern.
- 2.3 Check Valves:
  - 2.3.1 Construction: Construct valves of castings free of any impregnating materials. Construct valves with a bronze regrounding disc with a seating angle of 40° to 45°, unless a composition disc is

specified. Provide stop plug as renewable stop for disc hanger, unless otherwise specified. Disc and hanger shall be separate parts with disc free to rotate. Support hanger pins on both ends by removable side plugs.

2.3.2 Comply with the following standards:

Cast Iron Valves: MSS SP-71. Cast Iron Swing Check Valves, Flanged and Threaded Ends.

Bronze Valves: MSS SP-80. Bronze Gate, Globe, Angle and Check Valves.

Steel Valves: ANSI B16.34. Steel Standard Class Valve Ratings.

2.3.3 Types of check (CK) valves:

- 1 Threaded Ends 2" and Smaller (CK1): Class 125, bronze body, screwed cap, horizontal swing, bronze disc. Stockham B-319. Nibco T-413-BY. Crane 1707. Milwaukee 509.
- 2 Soldered Ends 2" and Smaller (CK2): Class 125, bronze body, screwed cap, horizontal swing, bronze disc. Stockham B-309. Nibco S-413-B. Crane 1707S. Milwaukee 1509.
- 3 Flanged Ends 2½" and Larger (CK3): Class 125, iron body, bronze-mounted, bolted cap, horizontal swing, cast-iron or composition disc. Stockham G-931 or G-932 as applicable. Nibco F918-B. Crane 373. Milwaukee F2974 as applicable.
- 4 Threaded Ends 2" and Smaller (CK4): 200 WWP, bronze body, screwed cap, horizontal swing, regrinding type bronze disc, for fire sprinkler use. Nibco KT-403-W.
- 5 Flanged Ends 2½" and Larger (CK5): 175 WWP, iron body, bolted cap, bronze mounted, composition disc, UL listed, with ball drip if required. Stockham G-940. Nibco F-908-W.
- 6 Threaded Ends 2" and Smaller (CK6): Class 200, bronze body, screwed cap, Y-pattern swing, regrinding bronze disc. Stockham B-345. Nibco T-453-B. Crane 36. Milwaukee 518/508.
- 7 Flanged Ends 2½" and Larger (CK7): Class 250, iron body, bronze mounted, bolted cap, cast-iron disc. Stockham F-947. Nibco F-968-B. Crane 39E. Milwaukee F2970.
- 8 Threaded Ends 2" and Smaller (CK8): Class 300, bronze body, screwed cap, Y-pattern swing, regrinding bronze disc. Stockham B-375. Nibco T-473-B. Crane 76E. Milwaukee 517/507.
- 9 Flanged Ends 2½" and Larger (CK9): Class 300, cast steel body, bolted cap, horizontal swing, seal welded seat rings, chromium stainless disc. Stockham 30-SF. Crane 159.
- 10 Nonslam Silent Check (CK10): Iron body, spring actuated, globe style silent check valve with renewable seats and disk. Nibco F-910 (125 lb.wog) or Nibco F-960 (250 lb wog) as required.

2.4 Ball Valves:



2.4.1 General: Select with port area equal to or greater than connecting pipe area, include seat ring designed to hold sealing material.

2.4.2 Construction: Ball valves shall be rated for 150 psi saturated steam and 600 psi non-shock cold water. Pressure containing parts shall be constructed of ASTM B-584 alloy 844, or ASTM B-124 alloy 377. Valves shall be furnished with blow-out proof bottom loaded stainless steel stem. Provide TFE packing, TFE thrust washer, stainless steel ball and reinforced teflon seats. Valves 2" and smaller shall be full port design. Valves 2½" and larger shall be conventional port design. Stem extensions shall be furnished for use in insulated piping where insulation exceeds ½" thickness.

2.4.3 Comply with the following standards:

MSS SP-72. Ball Valves with Flanged or Butt Welding Ends for General Service.

MSS SP-110. Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

2.4.4 Types of ball (BA) valves:

- 1 Threaded Ends 2" and Smaller (BA1): Bronze two-piece full port body with adjustable stem packing. Nibco T-585-70-66. Apollo 77-140.
- 2 Soldered Ends 2" and Smaller (BA2): Bronze two-piece full port body with adjustable stem packing. Nibco S-585-70-66. Apollo 77-240.
- 3 Threaded Ends 1" and Smaller (BA3): Bronze two-piece full port body, UL listed (UL 842) for use with flammable liquids and LP gas. Nibco T-585-70-66-UL.
- 4 Threaded Ends 2" and Smaller (BA4): 175 WWP, bronze two-piece body, UL listed for fire protection service. Nibco KT-585-70-66-UL and KT-580-70-66-UL.
- 5 Threaded Ends 2" and Smaller (BA5): 400 WWP, bronze two-piece body, for fire protection service. Nibco KT-580.
- 6 Threaded Ends 2½" and Smaller (BA6): 300 WWP, bronze three-piece body, gear operator with handwheel, indicator flag, accepts tamper switch, for fire protection, UL listed. Nibco T-505-4 and G-505-4.
- 7 Flanged Ends 2½" and Larger (BA7): Class 150, carbon steel full bore two-piece body with adjustable stem packing. Nibco F515-CS series. Apollo 88-240.
- 8 Threaded Ends 3" and Smaller (BA8): Bronze three-piece full port body, with stainless steel ball and stem suitable for steam service. 600 WOG/ 150 SWP. Milwaukee BA-300 S or approved equal.

2.5 Valve Features:

2.5.1 General: Provide valves with features indicated and, where not otherwise indicated, provide proper valve features as determined by Installer for installation requirements. Comply with ANSI B31.1

2.5.2 Valve features specified or required shall comply with the following:

- 1 Threaded: Provide valve ends complying with ANSI B1.20.1.
- 2 Solder-Joint: Provide valve ends complying with ANSI B16.18.
- 3 Trim: Fabricate pressure-containing components of valve, including stems (shafts) and seats from brass or bronze materials, of standard alloy recognized in valve manufacturing industry unless otherwise specified.
- 4 Non-Metallic Disc: Provide non-metallic material selected for service indicated in accordance with manufacturer's published literature.
- 5 Renewable Seat: Design seat of valve with removable disc, and assemble valve so disc can be replaced when worn.
- 6 Extended Stem: Increase stem length by 2" minimum, to accommodate insulation applied over valve.

3 EXECUTION

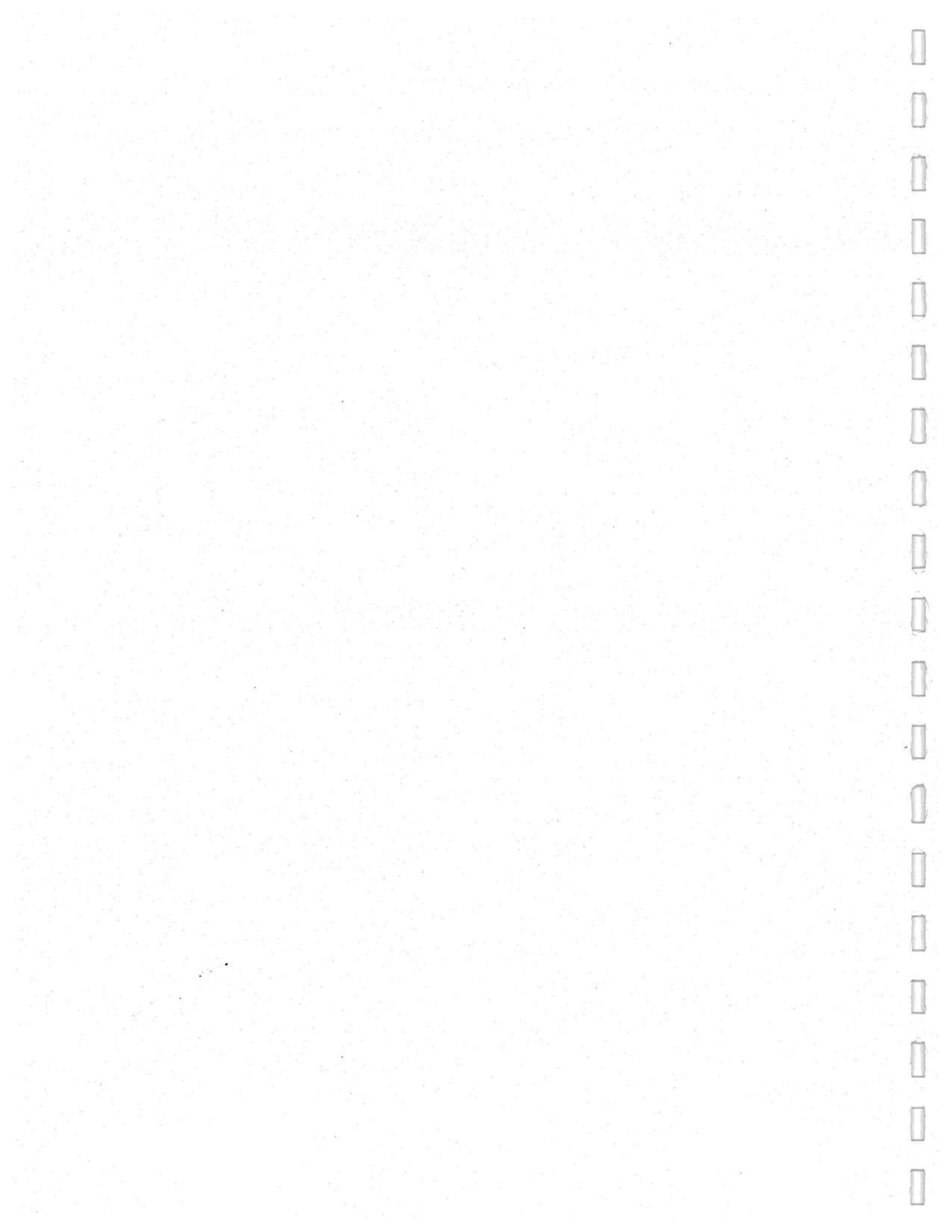
3.1 Installation:

- 3.1.1 General: Install valves where required for proper operation of piping and equipment, including valves in branch lines to isolate sections of piping. Locate valves so as to be accessible and so that separate support can be provided when necessary. Install valves with stems pointed up, in vertical position where possible, but in no case with stems pointed downward below horizontal plane.
- 3.1.2 Insulation: Where insulation is indicated, install extended-stem valves, arranged in proper manner to receive insulation.
- 3.1.3 Applications Subject to Corrosion: Do not install bronze valves and valve components in direct contact with steel, unless bronze and steel are separated by dielectric insulator.
- 3.1.4 Mechanical Actuators: Install mechanical actuators as recommended by valve manufacturer.
- 3.2 Selection of Valve Ends (Pipe Connections): Except as otherwise indicated, select and install valves with the following ends or types of pipe/tube connections:
  - 3.2.1 Tube Size 2" and Smaller: Threaded valves. Soldered-joint valves may also be used.
  - 3.2.2 Pipe Size 2" and Smaller: Threaded valves.
  - 3.2.3 Pipe Size 2½" and Larger: Flanged valves.
- 3.3 Non-Metallic Disc: Limit selection and installation of valves with non-metallic disc to locations indicated and where foreign material in piping system can be expected to prevent tight shutoff of metal seated valves.



- 3.4 Renewable Seats: Select and install valves with renewable seats, except where otherwise indicated.
- 3.5 Installation of Check Valves: Install in horizontal position with hinge pin horizontally perpendicular to center line of pipe. Install for proper direction flow. Nonslam check valves installed at pump discharge shall be installed at least four pipe diameters from the pump discharge or any elbows. Provide flow straighteners if conditions prohibit required clearances.

END OF SECTION





SECTION 15120/PIPING SPECIALTIES1 GENERAL

1.1 Drawings and general provisions of contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 This section is a Division-15 Basic Mechanical Materials and Methods section, and is part of each Division-15 section making reference to or requiring piping specialties specified herein.

1.3 Approval Submittals:

1.3.1 Product Data: Submit product data with installation instructions and UL listing for:

1.3.1.1 Fire barrier sealants.

2 PRODUCTS

2.1 General: Provide factory-fabricated piping specialties recommended by manufacturer for use in service indicated. Provide piping specialties of types and pressure ratings indicated for each service, or if not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide sizes as indicated, and connections, which properly mate with pipe, tube, and equipment connections. Where more than one type is indicated, selection is Installer's option.

2.2 Escutcheons:

2.2.1 General: Provide pipe escutcheons as specified herein with inside diameter closely fitting pipe outside diameter, or outside of pipe insulation where pipe is insulated. Select outside diameter of escutcheon to completely cover pipe penetration hole in floors, walls, or ceilings; and pipe sleeve extension, if any. Furnish pipe escutcheons with nickel or chrome finish for occupied areas, prime paint finish for unoccupied areas.

2.2.2 Pipe Escutcheons for Moist Areas: For waterproof floors, and areas where water and condensation can be expected to accumulate, provide cast brass or sheet brass escutcheons, solid or split hinged.

2.2.3 Pipe Escutcheons for Dry Areas: Provide sheet steel escutcheons, solid or split hinged.

2.3 Dielectric Unions: Provide standard products recommended by manufacturer for use in service indicated, which effectively isolate ferrous from non-ferrous piping (electrical conductance), prevent galvanic action and stop corrosion.

2.4 Fire Barrier Penetration Seals:

2.4.1 Provide seals for any opening through fire-rated walls, floors, or ceilings used as passage for mechanical components such as piping or ductwork in accordance with the requirements of





SECTION 15135/VIBRATION ISOLATION1 GENERAL

- 1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- 1.2 This section is a Division-15 Basic Mechanical Materials and Methods section, and is part of each Division-15 section making reference to vibration isolation equipment.
- 1.3 Extent of vibration isolation required by this section is indicated on drawings and/or specified in other Division-15 sections.
- 1.4 Approval Submittals: When required by other Division-15 sections, submit product data sheets for each type of vibration isolation equipment including configuration and rating data. Submit with Division-15 section using vibration isolation, not as a separate submittal. Provide calculations showing supported weight, deflection, and isolator size and type for each item of supported equipment. Submit for:
- 1.4.1 Equipment Mountings. Type EM.
- 1.5 O&M Data Submittals: Submit a copy of approval submittals for each type of vibration isolation equipment. Include this data in O&M Manual.

2 PRODUCTS

- 2.1 General: Provide factory-fabricated products recommended by manufacturer for use in service indicated. Provide products of types and deflections indicated; provide proper selection as determined by Installer to comply with specifications and installation requirements. Provide sizes which properly fit with equipment. All metal parts installed outside shall be hot dipped galvanized after fabrication.
- 2.2 Acceptable Manufacturers: Subject to compliance with requirements, provide vibration isolation equipment of: Mason Industries, Keflex, Consolidated Kinetics, Vibration Mountings & Controls, Wheatley or approved equal. All vibration isolators shall be supplied by a single approved manufacturer.
- 2.3 Equipment Mountings:
- 2.3.1 Select mountings with the required deflection and fastening means. Provide steel rails or bases as required to compensate for equipment rigidity and overhang.
- 2.3.2 Types of equipment mountings (EM):
- 1 Spring Mountings (EM1): Spring isolators shall be free-standing and laterally stable without any housing. All mounts shall have leveling bolts. Spring diameter shall be not less than 0.8 of the compressed height of the spring at rated load. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection. Springs shall be so designed that the ratio of horizontal stiffness to vertical stiffness is approximately one. Provide a

nominal static deflection of at least 1.0". Basis of Design: Mason Industries SLFH.

- 2 Spring Mountings with Housings (EM2): Spring isolators shall consist of open, stable steel springs and include vertical travel limit stops to control extension when weight is removed. The housing of the spring unit shall serve as blocking during erection of equipment. Provide a nominal static deflection of at least 1.0". All mountings used outside shall be hot dipped galvanized. Basis of Design: Mason Industries SLR.
- 3 Spring Mountings with Housings (EM3): Spring isolators shall consist of open, stable steel springs with neoprene inserts to limit movement between upper and lower housing on start and stop. Provide a nominal static deflection of at least 1.0". Mountings shall be specifically designed for critical areas on light-weight floors. Basis of Design: Mason Industries C.
- 4 Neoprene Mountings (EM4): Double deflection neoprene-in-shear mountings shall have a minimum static deflection of 0.35". All metal surfaces shall be neoprene covered. The top and bottom surfaces shall be neoprene ribbed and bolt holes shall be provided in the base. Basis of design: Mason Industries ND.
- 5 Pads (EM5): Waffle or ribbed pattern neoprene pads shall be fabricated from 40-50 durometer neoprene. Provide rigid steel plate and mounting angles as required. Basis of design: Mason Industries Super W.

### 3 EXECUTION

- 3.1 Install vibration isolation devices for the duty indicated and for ease of inspection, adjustment, and proper operation. Install in accordance with the manufacturer's written instructions and coordinate with shop drawings of supported equipment.
- 3.2 All connections to fixtures and equipment shown on the drawings shall be considered diagrammatic unless otherwise indicated by detail. The actual connections shall be made to fully suit the requirements of each case and adequately provide for expansion and servicing.
- 3.3 Piping, ductwork and conduit shall not be suspended from one another or physically contact one another. Vibrating systems shall be kept free from non-vibrating systems.
- 3.4 Equipment Mountings:
  - 3.4.1 Unless otherwise shown or specified, all floor-mounted equipment shall be set on housekeeping equipment bases. Refer to Division-15 section "Supports, Anchors, and Seals".
  - 3.4.2 No equipment unit shall bear directly on vibration isolators unless its own frame is suitably rigid to span between isolators, and such direct support is approved by the equipment manufacturer. All support frames shall be sufficiently stiff and rigid so as to prevent distortion and misalignment of components installed thereon.
  - 3.4.3 Align equipment mountings for a free, plumb installation. Isolators that are binding, offset or fully compressed will not be accepted.



- 3.5 Connections of Ducts: Ducts shall be connected to fan intakes and discharges by means of flexible connectors in accordance with Division-15 section "Ductwork Accessories" so that all vibrating equipment is fully isolated.

END OF SECTION



SECTION 15150/SUPPORTS, ANCHORS, AND SEALS1 GENERAL

- 1.1 Drawings and general provisions of Contract, including General Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- 1.2 This section is a Division-15 Basic Materials and Methods section, and is a part of each Division-15 section making reference to or requiring supports, anchors, and seals specified herein.
- 1.3 Extent of supports, anchors, and seals required by this section is indicated on drawings and/or specified in other Division-15 sections.
- 1.4 Code Compliance: Comply with applicable codes pertaining to product materials and installation of supports, anchors, and seals.
- 1.5 MSS Standard Compliance:
  - 1.5.1 Provide pipe hangers and supports of which materials, design, and manufacture comply with ANSI/MSS SP-58.
  - 1.5.2 Select and apply pipe hangers and supports, complying with MSS SP-69.
  - 1.5.3 Fabricate and install pipe hangers and supports, complying with MSS SP-89.
  - 1.5.4 Terminology used in this section is defined in MSS SP-90.

2 PRODUCTS

- 2.1 Acceptable Manufacturers: Subject to compliance with requirements, provide supports and hangers by Grinnel, Michigan Hanger Company, B-Line Systems, or approved equal.
- 2.2 Horizontal-Piping Hangers and Supports: Except as otherwise indicated, provide factory-fabricated horizontal-piping hangers and supports complying with ANSI/MSS SP-58, of one of the following MSS types listed, selected by Installer to suit horizontal-piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hangers and supports to exactly fit pipe size for bare piping, and to exactly fit around piping insulation with saddle or shield for insulated piping. Provide copper-plated hangers and supports for copper-piping systems.
  - 2.2.1 Adjustable Steel Clevises: MSS Type 1.
  - 2.2.2 Steel Double Bolt Pipe Clamps: MSS Type 3.
  - 2.2.3 Adjustable Steel Band Hangers: MSS Type 7.
  - 2.2.4 Steel Pipe Clamps: MSS Type 4.



- 2.3 Vertical-Piping Clamps: Except as otherwise indicated, provide factory-fabricated vertical-piping clamps complying with ANSI/MSS SP-58, of one of the following MSS types listed, selected by Installer to suit vertical piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Select size of vertical piping clamps to exactly fit pipe size of bare pipe. Provide copper-plated clamps for copper-piping systems.
- 2.3.1 Two-Bolt Riser Clamps: MSS Type 8.
- 2.3.2 Four-Bolt Riser Clamps: MSS Type 42.
- 2.4 Hanger-Rod Attachments: Except as otherwise indicated, provide factory-fabricated hanger-rod attachments complying with ANSI/MSS SP-58, of one of the following MSS types listed, selected by Installer to suit horizontal-piping hangers and building attachments, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hanger-rod attachments to suit hanger rods. Provide copper-plated hanger-rod attachments for copper-piping systems.
- 2.4.1 Steel Turnbuckles: MSS Type 13.
- 2.4.2 Malleable Iron Sockets: MSS Type 16.
- 2.5 Building Attachments: Except as otherwise indicated, provide factory-fabricated building attachments complying with ANSI/MSS SP-58, of one of the following MSS types listed, selected by Installer to suit building substrate conditions, in accordance with MSS SP-69 and manufacturer's published product information. Select size of building attachments to suit hanger rods.
- 2.5.1 Center Beam Clamps: MSS Type 21.
- 2.5.2 C-Clamps: MSS Type 23.
- 2.5.3 Malleable Beam Clamps: MSS Type 30.
- 2.5.4 Side Beam Brackets: MSS Type 34.
- 2.5.5 Concrete Inserts: MSS Type 18.
- 2.6 Saddles and Shields: Except as otherwise indicated, provide saddles or shields under piping hangers and supports, factory-fabricated, for all insulated piping. Size saddles and shields for exact fit to mate with pipe insulation.
- 2.6.1 Protection Shields: MSS Type 40; of length recommended by manufacturer to prevent crushing of insulation.
- 2.6.2 Protection Saddles: MSS Type 39; use with rollers, fill interior voids with segments of insulation matching adjoining insulation.
- 2.7 Miscellaneous Materials:

- 2.7.1 Metal Framing: Provide products complying with NEMA STD ML 1.
- 2.7.2 Steel Plates, Shapes and Bars: Provide products complying with ANSI/ASTM A 36.
- 2.7.3 Cement Grout: Portland cement (ANSI/ASTM C 150, Type I or Type III) and clean uniformly graded, natural sand (ANSI/ASTM C 404, Size No. 2). Mix at a ratio of 1.0 part cement to 3.0 parts sand, by volume, with minimum amount of water required for placement and hydration.
- 2.7.4 Heavy-Duty Steel Trapezes: Fabricate from steel shapes or continuous channel struts selected for loads required; weld steel in accordance with AWS standards.

### 3 EXECUTION

#### 3.1 Preparation

- 3.1.1 Proceed with installation of hangers, supports and anchors only after required building structural work has been completed in areas where the work is to be installed. Correct inadequacies including (but not limited to) proper placement of inserts, anchors and other building structural attachments.

- 3.1.2 Prior to installation of hangers, supports, anchors and associated work, Installer shall meet at project site with Contractor, installer of each component of associated work, and installers of other work requiring coordination with work of this section for purpose of reviewing material selections and procedures to be followed in performing the work in compliance with requirements specified.

#### 3.2 Installation of Building Attachments:

- 3.2.1 Install building attachments at required locations within concrete or on structural steel for proper piping support. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional building attachments where support is required for additional concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten insert securely to forms. Where concrete with compressive strength less than 2500 psi is indicated, install reinforcing bars through openings at top of inserts.

#### 3.3 Installation of Hangers and Supports:

- 3.3.1 General: Install hangers, supports, clamps and attachments to support piping properly from building structure; comply with MSS SP-69. Arrange for grouping of parallel runs of horizontal piping to be supported together on trapeze type hangers where possible. Install supports with maximum spacings complying with MSS SP-69, Florida Building Code-Plumbing and Mechanical, or as listed herein, whichever is most limiting. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe. Do not use wire or perforated metal to support piping, and do not support piping from other piping.



- 3.3.1.1 Horizontal copper tube 1 ½" diameter and smaller: support on 6 foot centers.
- 3.3.1.2 Horizontal copper tube over 1 ½" diameter: support on 10 foot centers.
- 3.3.1.3 Vertical copper tube: support at each floor.
- 3.3.1.4 PVC pipe: support in accordance with manufacturer's recommendations, but not less than 4 foot centers.
- 3.3.2 Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers and other accessories.
- 3.3.3 Paint all black steel hangers with black enamel. Galvanized steel and copper clad hangers do not require paint.
- 3.3.4 Prevent electrolysis in support of copper tubing by use of hangers and supports which are copper plated, or by other recognized industry methods.
- 3.3.5 Provision for Movement:
  - 3.3.5.1 Install hangers and supports to allow controlled movement of piping systems and to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends and similar units.
  - 3.3.5.2 Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.
  - 3.3.5.3 Pipe Slopes: Install hangers and supports to provide indicated pipe slopes, and so that maximum pipe deflections allowed by ANSI B31 are not exceeded.
- 3.3.6 Insulated Piping: Comply with the following installation requirements.
  - 3.3.6.1 Clamps: Attach clamps, including spacers (if any), to piping with clamps projecting through insulation; do not exceed pipe stresses allowed by ANSI B31.
- 3.4 Installation of Anchors:
  - 3.4.1 Install anchors at proper locations to prevent stresses from exceeding those permitted by ANSI B31, and to prevent transfer of loading and stresses to connected equipment.
  - 3.4.2 Fabricate and install anchors by welding steel shapes, plates and bars to piping and to structure. Comply with ANSI B31 and with AWS standards.
  - 3.4.3 Anchor Spacings: Where not otherwise indicated, install anchors at ends of principal pipe-runs, at intermediate points in pipe-runs between expansion loops and elbows. Make provisions for preset of anchors as required to accommodate both expansion and contraction of piping.



3.5 Equipment Bases:

- 3.5.1 Provide concrete housekeeping bases for all floor mounted equipment furnished as part of the work of Division 15. Size bases to extend minimum of 4" beyond equipment base in any direction; and 4" above finished floor elevation. Construct of reinforced concrete, roughen floor slab beneath base for bond, and provide steel rod anchors between floor and base. Locate anchor bolts using equipment manufacturer's templates. Chamfer top and edge corners.
- 3.5.2 Provide structural steel stands to support equipment not floor mounted or hung from structure. Construct of structural steel members or steel pipe and fittings. Provide factory-fabricated tank saddles for tanks mounted on steel stands. Prime and paint with black enamel.

END OF SECTION



SECTION 15160/MECHANICAL IDENTIFICATION1 GENERAL

- 1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- 1.2 This section is a Division-15 Basic Mechanical Materials and Methods section, and is part of each Division-15 section making reference to or requiring identification devices specified herein.
- 1.3 Extent of mechanical identification work required by this section is indicated on drawings and/or specified in other Division-15 sections.
- 1.4 Refer to Division-16 sections for identification requirements of electrical work; not work of this section. Refer to other Division-15 sections for identification requirements for controls; not work of this section.
- 1.5 Codes and Standards: Comply with ANSI A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

2 PRODUCTS

- 2.1 General: Provide manufacturer's standard products of categories and types required for each application as referenced in other Division-15 sections. Where more than single type is specified for application, selection is Installer's option, but provide single selection for each product category.
- 2.2 Painted Identification Materials
  - 2.2.1 Stencils: Standard fiberboard stencils, prepared for required applications with letter sizes generally complying with recommendations of ANSI A13.1 for piping and similar applications, but not less than 1-1/4" high letters for ductwork and not less than 3/4" high letters for access door signs and similar operational instructions.
  - 2.2.2 Stencil Paint: Standard exterior type stenciling enamel; black, except as otherwise indicated; either brushing grade or pressurized spray-can form and grade.
  - 2.2.3 Identification Paint: Standard identification enamel.
- 2.3 Plastic Pipe Markers
  - 2.3.1 Pressure-Sensitive Type: Provide manufacturer's standard pre-printed, permanent adhesive, color-coded, pressure-sensitive vinyl pipe markers.
    - 2.3.1.1 Lettering: Manufacturer's standard pre-printed nomenclature which best describes piping system in each instance, as selected by Architect/Engineer in cases of variance with name as shown or specified.



- 2.3.1.2 Arrows: Print each pipe marker with arrows indicating direction of flow, either integrally with piping system service lettering (to accommodate both directions), or as separate unit of plastic.
- 2.4 Valve Tags:
- 2.4.1 Brass Valve Tags: Provide 19-gage polished brass valve tags with stamp-engraved piping system abbreviation in ¼" high letters and sequenced valve numbers ½" high, and with 5/32" hole for fastener. Provide 1-½" diameter tags, except as otherwise indicated.
- 2.4.2 Plastic Laminate Valve Tags: Provide manufacturer's standard 3/32" thick engraved plastic laminate valve tags, with piping system abbreviation in ¼" high letters and sequenced valve numbers ½" high, and with 5/32" hole for fastener. Provide 1-½" square black tags with white lettering, except as otherwise indicated.
- 2.5 Engraved Plastic-Laminate Signs:
- 2.5.1 General: Provide engraving stock melamine plastic laminate, in the sizes and thicknesses indicated, engraved with engraver's standard letter style of the sizes and wording indicated, punched for mechanical fastening except where adhesive mounting is necessary because of substrate.
- 2.5.2 Thickness: 1/16" for units up to 20 sq. in. or 8" length; ⅛" for larger units.
- 2.5.3 Fasteners: Self-tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate the substrate.
- 2.6 Stamped Nameplates: Provide equipment manufacturer's standard stamped nameplates for motors, AHUs, pumps, etc.

### 3 EXECUTION

- 3.1 Coordination: Where identification is to be applied to surfaces which require insulation, painting or other covering or finish, including valve tags in finished mechanical spaces, install identification after completion of covering and painting. Install identification prior to installation of acoustical ceilings and similar removable concealment.
- 3.2 Ductwork Identification:
- 3.2.1 General: Identify air supply, return, exhaust, intake and relief ductwork with stenciled signs and arrows, showing ductwork service and direction of flow, in black or white.
- 3.2.2 Location: In each space where ductwork is exposed, or concealed only by removable ceiling system, locate signs near points where ductwork originates or continues into concealed enclosures, and at 50' spacings along exposed runs.
- 3.2.3 Access Doors: Provide stenciled signs on each access door in ductwork and housings, indicating purpose of access (to what equipment) and other maintenance and operating instructions, and appropriate and procedural information.

### 3.3 Piping System Identification:

3.3.1 General: Install pipe markers of one of the following types on each system indicated to receive identification, and include arrows to show normal direction of flow:

3.3.1.1 Plastic pipe markers.

3.3.1.2 Stenciled markers, black or white for best contrast.

3.3.2 Locate pipe markers as follows wherever piping is exposed to view in occupied spaces, machine rooms, accessible maintenance spaces and exterior non-concealed locations.

3.3.2.1 Near each valve and control device.

3.3.2.2 Near each branch, excluding short take-offs for fixtures and terminal units; mark each pipe at branch, where there could be question of flow pattern.

3.3.2.3 Near locations where pipes pass through walls, floors, ceilings, or enter non-accessible enclosures.

3.3.2.4 At access doors, manholes and similar access points which permit view of concealed piping.

3.3.2.5 Near major equipment items and other points of origination and termination.

3.3.2.6 Spaced intermediately at maximum spacing of 50' along each piping run, except reduce spacing to 25' in congested areas of piping and equipment.

3.3.2.7 On piping above removable acoustical ceilings, except omit intermediately spaced markers.

3.4 Valve Identification: Provide coded valve tag on every valve, cock and control device in each piping system; exclude check valves, valves within factory-fabricated equipment units, plumbing fixture faucets, convenience and lawn-watering hose bibs, and shut-off valves at plumbing fixtures, HVAC terminal devices and similar rough-in connections of end-use fixtures and units. Coordinate code with operating instructions.

3.5 Mechanical Equipment Identification: Install engraved plastic laminate sign on or near each major item of mechanical equipment and each operational device. Label shall indicate type of system and area served. Provide signs for the following general categories of equipment and operational devices:

3.5.1 Main control and operating valves, including safety devices.

3.5.2 Fans.

3.5.3 Air conditioning indoor and outdoor units.

3.6 Stamped Nameplates: Equipment manufacturers to provide standard stamped nameplates on all



major equipment items such as motors, pumps, AHUs, etc. Where motors are hidden from view (within equipment casing, or otherwise not easily accessible, etc.), the equipment supplier shall furnish a duplicate motor data nameplate to be affixed to the equipment casing in an easily visible location, unless data is already included on the equipment nameplate.

3.7 Adjusting and Cleaning:

3.7.1 Adjusting: Relocate any mechanical identification device which has become visually blocked by work of this division or other divisions.

3.7.2 Cleaning: Clean face of identification devices.

END OF SECTION



SECTION 15170/ACCESS DOORS1 GENERAL

- 1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- 1.2 This section is a Division-15 Basic Mechanical Materials and Methods section, and is part of each Division-15 section making reference to or requiring access panels specified herein.
- 1.3 Approval Submittals:
- 1.3.1 Product Data: When required by other Division-15 sections, submit product data for access doors. Submit with Division-15 section using access doors, not as a separate submittal. Include rating data.
- 1.4 O&M Data Submittals: Submit a copy of approval submittal. Include this data in O&M Manuals.

2 PRODUCTS

- 2.1 Acceptable Manufacturers: Subject to compliance with requirements, provide access doors by Milcor, Jay R. Smith, Zurn, BOICO, Elmdor, or approved equal.
- 2.2 General: Where floors, walls and ceilings must be penetrated for access to mechanical work, provide types of access doors indicated. Furnish sizes indicated or, where not otherwise indicated, furnish adequate size for intended and necessary access. Furnish manufacturer's complete units, of type recommended for application in indicated substrate construction, in each case, complete with anchorages and hardware.
- 2.3 Access Door Construction: Except as otherwise indicated, fabricate wall/ceiling door units of welded steel construction with welds ground smooth; 16-gauge frames and 14-gauge flush panel doors; 175° swing with concealed spring hinges; flush screw-driver-operated cam locks; factory-applied rust-inhibitive prime-coat paint finish.
- 2.4 Locks: Where indicated, provide flat pass key type individually keyed unless otherwise indicated, 2 keys.
- 2.5 Fire Rated Access Doors: Where required furnish with 20-gauge insulated sandwich panel, automatic closing mechanism, cylinder type lock (self-latching with inside release mechanism), and continuous concealed steel hinge pin. Access doors shall carry the UL 1-½ hour "B" label.

3 EXECUTION

- 3.1 Access doors shall be installed to operate and service all mechanical equipment including valves, dampers, duct access panels, and other items requiring maintenance that are concealed above or behind finished construction. Access doors shall be installed in walls, chase and floors as necessary, but are not required in accessible suspended ceiling systems. Access doors shall have factory applied protective phosphate coating and baked enamel primer suitable for field painting.

- 3.2 Access doors shall be installed by the Division installing the substrate construction. However, responsibility for furnishing and determining location of access doors is part of this Division's work. The style of access door shall be suitable for construction into which installed.
- 3.3 Access doors shall be sized and located as required to provide proper maintenance and service access in accordance with the manufacturer's recommendations and code authority requirements for all devices and equipment.

END OF SECTION

SECTION 15180/TESTING, CLEANING, AND STERILIZATION OF PIPING SYSTEMS1 GENERAL

- 1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- 1.2 This section is a Division-15 Basic Mechanical Materials and Methods section, and is part of each Division-15 section making reference to or requiring the testing and other procedures specified herein.
- 1.3 Notify the Architect/Engineer when system tests are ready to be witnessed at least 24 hours prior to the test.
- 1.4 All materials, test equipment, and devices required for cleaning, testing, sterilizing or purging shall be provided by the Contractor.

2 PRESSURE TESTS

- 2.1 General: Provide temporary equipment for testing, including pump and gauges. Test piping systems before insulation is installed wherever feasible, and remove control devices before testing. Test each natural section of each piping system independently but do not use piping system valves to isolate sections where test pressure exceeds valve pressure rating. Fill each section with indicated medium and pressurize for indicated pressure and time.
- 2.2 Required test period is 2 hours.
- 2.3 No piping, fixtures, or equipment shall be concealed or covered until they have been tested. The contractor shall apply each test and ensure that it is satisfactory for the period specified before calling the Architect/Engineer to observe the test. Test shall be repeated upon request to the satisfaction of those making the inspection.
- 2.4 Observe each test section for leakage at the end of the test period. Test fails if leakage is observed or if pressure drop exceeds 5% of the test pressure.
- 2.5 Check of systems during application of test pressures should include visual check for water leakage and soap bubble or similar check for air and nitrogen leakage.
- 2.6 During heating and cooling cycles, linear expansion shall be checked at all elbows and expansion joints for proper clearance.
- 2.7 Repair piping systems sections which fail required piping test. Disassemble and re-install using new materials to extent required to overcome leakage. Do not use chemicals, stop-leak compounds, mastics, or other temporary repair methods.
- 2.8 Pressure Test Requirements:
  - 2.8.1 Soil, Waste and Vent: Test all piping within the building with a 10 foot head of water. Test



piping in sections so that all joints are tested. Provide test tees as required. A smoke test can be used at the Contractor's option.

- 2.8.2 Domestic Water: Perform hydrostatic test on all piping within the building at twice the normal static pressure at service point, but not less than 100 psig. Once tested, flush out piping and leave under pressure of the supply main or 40 psig for the balance of the construction period.

- 2.8.3 Gas: Test with air or nitrogen at 150% of normal working pressure, but not less than 25 psig. The test and check for leaks shall be in accordance with NFPA-54.

### 3 CLEANING AND STERILIZATION

- 3.1 General: Clean exterior surfaces of installed piping systems of superfluous materials, and prepare for application of specified coatings (if any). Flush out piping systems with clean water or blowdown with air before proceeding with required tests. Inspect each run of each system for completion of joints, supports and accessory items.

- 3.2 Flush and drain all water systems at least three times. Reverse flush systems from smallest piping to largest piping. Replace startup strainers with operating strainers.

#### 3.3 Sterilization of Domestic Water Systems:

- 3.3.1 Prerequisites: All new hot and cold water piping installed (complete), all fixtures connected, system flushed out, and system filled with water.

- 3.3.2 The shut off valve at the point of connection shall be closed, all fixture outlets opened slightly, and a sterilizing solution shall be introduced at a manifold connection installed by the Contractor at the point of connection.

- 3.3.3 The solution shall contain 50 parts per million of available chlorine. The chlorinating material shall be either liquid chlorine or calcium hypochlorite. The solution shall be allowed to stand in the system for at least eight hours after which the entire system shall be flushed.

- 3.3.4 After final flushing, all aerators shall be removed, cleaned, and reinstalled. After final flush the residual chlorine shall not exceed 0.2 parts per million.

- 3.3.5 The Architect/Engineer shall be notified 24 hours prior to the procedure so that it can be witnessed.

- 3.3.6 Provide sampling and certified report by an independent testing lab. Provide written Health Department approval of disinfection samples.

- 3.4 Fuel Gas: Purge all fuel gas systems in accordance with NFPA 54.

END OF SECTION

SECTION 15190/EXCAVATION & BACKFILL1 GENERAL

- 1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- 1.2 This section is a Division-15 Basic Mechanical Materials and Methods section, and is part of each Division-15 section making reference to or requiring excavation and backfill specified herein.
- 1.3 Existing Utilities: Underground utilities shown were taken from old drawings. The exact location of these utilities and irrigation branches and abandoned services are not known. Use extreme caution when excavating.
- 1.4 Refer to other Division-15 sections and/or drawings for specific requirements of the particular piping system being installed. Where another Division-15 section or the drawings conflict with requirements of this section, the other Division-15 section or the drawings shall take precedence over the general requirements herein.
- 1.5 OSHA: Contractor employee worker protection for all trenching and excavation operations shall comply with 29 CFR 1926.650 Subpart P and all current OSHA requirements. Contractor shall also erect barriers, provide shoring and maintain excavations as required to protect the public and adjacent traffic.

2 PRODUCTS

- 2.1 Sand: Clean, hard, uncoated grains free from organic matter or other deleterious substances. Sand for backfill shall be of a grade equal to mortar sand.
- 2.2 Gravel: Clean, well graded hard stone or gravel, free from organic material. Size range to be from No. 4 screen retentions to 1".
- 2.3 Earth: Fill free of clay, muck, stones, wood, roots or rubbish.
- 2.4 Identification Tape: Polyethylene 6 inches wide, 3.5 mil solid core encased in a 1 mil thick protective plastic jacket continuously printed with "CAUTION" in large black letters and type of pipe below. Tape shall conform to APWA specifications.
- 2.5 Copper Identification Wire: 14-gauge, single conductor, type UF.

3 EXECUTION

- 3.1 Ditching and Excavation: Shall be performed by hand wherever there is a possibility of encountering obstacles or any existing utility lines of any nature whatsoever. Where clear and unobstructed areas are to be excavated, appropriate machine excavation methods may be employed. Avoid use of machine excavators within the limits of the building lines.
- 3.2 Bedding: Excavate to bottom grade of pipe to be installed, and shape bed of undisturbed earth



- to contour of pipe for a width of at least 50% of pipe diameter. If earth conditions necessitate excavation below grade of the pipe, such as due to the presence of clay, muck, or roots, subcut and bring bed up to proper elevation with clean, new sand (as described in paragraph 2.1), deposited in 6" layers and tamped. Notify Architect/Engineer if subcut exceeds 12", or if bed is of an unstable nature. In this case a 6" minimum layer of gravel will be required before sand bedding begins. Submit cost proposal if the earth conditions require subcut in excess of 12" or if gravel is required to achieve proper bedding.
- 3.3 Placing: Pipe shall be carefully handled into place. Avoid knocking loose soil from the banks of the trench into the pipe bed. Rig heavier sections with nylon slings in lieu of wire rope to avoid crushing or chipping. Pipe which is handled with insulation in place, coated pipe, and jacketed pipe shall have special handling slings as required to prevent damage to the material.
- 3.4 Backfilling: Deposit clean new sand (as described in paragraph 2.1) to 6" above the pipe and tamp. Then deposit sand or earth carefully in 6" layers, maintaining adequate side support, especially on nonferrous piping materials. Compact fill in 6" layers, using mechanical means, up to the top elevation of the pipe, and in 12" layers to rough or finish grade as required. Fine grade and restore surface to original condition.
- 3.5 Special: Excavations shall be installed and maintained in satisfactory condition during the progress of the work. Subsurface structures are to be constructed in adequately sized excavations. De-watering equipment shall be installed and properly maintained where required. Shoring shall be employed in the event of unstable soil condition, and in all cases where required by OSHA regulations and necessary to protect materials and personnel from injury.
- 3.6 Identification: Install identification tape directly above all underground piping, one tape for each pipe where multiple pipes are installed. Depth of tape shall be at least 6 inches below finished grade and 18" to 30" above buried pipe. Tape copper wire to non-metallic pipes.
- 3.7 Depth of Cover: Minimum cover for underground piping is 30 inches unless indicated otherwise.
- 3.8 Existing Pavement: Where new piping passes below existing streets, driveways, parking lots, or other paved areas, the pavement shall be saw cut. Backfill shall be compacted to 95% density and the pavement shall be patched to match existing pavement. Provide compaction tests and reports as required.

END OF SECTION

SECTION 15205/INSULATION FOR PLUMBING EQUIPMENT AND PIPING1 GENERAL

- 1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- 1.2 Division-15 Basic Mechanical Materials and Methods Sections apply to work of this section.
- 1.3 Approval Submittals:
  - 1.3.1 Product Data: Submit a producer's data sheets and installation instructions on each insulation system including insulation, coverings, adhesives, sealers, protective finishes, and other material recommended by the manufacturer for applications indicated. Submit for:
    - 1.3.1.1 Fiberglass pipe insulation
    - 1.3.1.2 Flexible unicellular piping insulation
- 1.4 O&M Data Submittals: Submit a copy of all approval submittals. Include in O&M Manual.

2 PRODUCTS

- 2.1 Acceptable Manufacturers: Subject to compliance with requirements, provide insulation products by Armacell, Industrial Insulation Group, Johns Manville, Knauf, Owens Corning, Pittsburgh Corning, U.S. Rubber, or approved equal. All products shall be asbestos-free.
- 2.2 Flame/Smoke Ratings: Provide composite mechanical insulation (insulation, jackets, coverings, sealers, mastics, and adhesive) with a flame-spread rating of 25 or less, and a smoke-developed rating of 50 or less, as tested by ANSI/ASTM E84.
- 2.3 Pipe Insulation Materials:
  - 2.3.1 Fiberglass Pipe Insulation: ASTM C547, Class 1 unless otherwise indicated. (Preformed sleeving with white all-service jacket, suitable for temperatures up to 450°F)
  - 2.3.2 Flexible Unicellular Pipe Insulation: ASTM C534, Type I. (Tubular, suitable for use to 200°F.)
  - 2.3.3 Staples, Bands, Wires, and Cement: As recommended by the insulation manufacturer for applications indicated.
  - 2.3.4 Adhesives, Sealers, Protective Finishes: Products recommended by the insulation manufacturer for the application indicated.
  - 2.3.5 Jackets: ASTM C921, Type I (vapor barrier) for piping below ambient temperature, Type II (vapor permeable) for piping above ambient temperature. Type I may be used for all piping at Installer's option.



### 3 EXECUTION

#### 3.1 General:

- 3.1.1 Install thermal insulation products in accordance with manufacturer's written instructions, and in compliance with recognized industry practices to ensure that insulation serves intended purpose.
- 3.1.2 Install insulation materials with smooth and even surfaces and on clean and dry surfaces. Redo poorly fitted joints. Do not use mastic or joint sealer as filler for gapping joints and excessive voids resulting from poor workmanship.
- 3.1.3 Maintain integrity of vapor-barrier on insulation and protect it to prevent puncture and other damage. Label all insulation "ASBESTOS FREE".
- 3.1.4 Do not apply insulation to surfaces while they are hot or wet.
- 3.1.5 Do not install insulation until systems have been checked and found free of leaks. Surfaces shall be clean and dry before attempting to apply insulation. A professional insulator with adequate experience and ability shall install insulation.
- 3.1.6 Do not install insulation on pipe systems until acceptance tests have been completed except for flexible unicellular insulation. Do not install insulation until the building is "dried-in".

#### 3.2 Fiberglass Pipe Insulation:

- 3.2.1 Insulate the following piping systems (indoor locations):
  - 3.2.1.1 Domestic hot water, 140° F and lower: up to 1½" pipe - ½" thick, 2" and larger pipe - 1" thick.
  - 3.2.1.2 Storm water piping above ceilings including roof drain body - ½" thick.
- 3.2.2 Apply insulation to pipe with all side and end joints butted tightly. Seal longitudinal lap by pressurizing with plastic sealing tool. Apply 3 inch wide self sealing butt strips to joints between insulation sections. Insulate all fittings, flanges, valves and strainers with premolded insulation. Apply coat of insulating cement to fittings and wrap with glass cloth overlapping each wrap 1" and adjacent pipe 2". Finish with heavy coat of general purpose mastic. Premolded PVC covers may also be used, but no flexible inserts are allowed.
- 3.2.3 Provide hanger or pipe support shields of 16 gauge (minimum) galvanized steel over the insulation which extends halfway up the pipe insulation cover and at least 6" on each side of the hanger.
- 3.2.4 Omit insulation on exposed plumbing fixture runouts from faces of wall or floor to fixture; on unions, flanges, strainer blowoffs, flexible connections and expansion joints.

#### 3.3 Flexible Unicellular Pipe Insulation:

- 3.3.1 Insulate the following piping systems:

- 3.3.1.1 Horizontal or vertical above-grade waste piping receiving condensate from air conditioning units to points of connection receiving waste from 4 or more fixtures -  $\frac{1}{2}$ " thick.
- 3.3.1.2 Horizontal or vertical above grade waste piping receiving discharge from ice machines, coolers, freezers or similar units to points of connection receiving waste form 4 or more fixtures -  $\frac{1}{2}$ " thick.
- 3.3.1.3 Air compressor after-cooler piping -  $\frac{3}{4}$ " thick.
- 3.3.2 Apply insulation in accordance with the manufacturer's recommendations and instructions. Mitre cut insulation to fit pipe fittings. Use approved cement to seal all joints and ends in the insulation.

END OF SECTION





SECTION 15210/INSULATION FOR HVAC EQUIPMENT AND PIPING1 GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 Division-15 Basic Mechanical Materials and Methods Sections apply to work of this section.

1.3 Approval Submittals:

1.3.1 Product Data: Submit producer's data sheets and installation instructions on each insulation system including insulation, coverings, adhesives, sealers, protective finishes, and other material recommended by the manufacturer for applications indicated. Submit for:

1.3.1.1 Flexible unicellular piping insulation

1.4 O&M Data Submittals: Submit a copy of all approval submittals. Include in O&M Manual.

2 PRODUCTS

2.1 Acceptable Manufacturers: Subject to compliance with requirements, provide insulation products by Armacell, Calsilite Group, Industrial Insulation Group, Johns Manville, Knauf, Owens Corning, Pittsburgh Corning, U.S. Rubber, or approved equal. All products shall be asbestos-free.

2.2 Flame/Smoke Ratings: Provide composite mechanical insulation (insulation, jackets, coverings, sealers, mastics, and adhesive) with a flame-spread rating of 25 or less, and a smoke-developed rating of 50 or less, as tested by ANSI/ASTM E84.

2.3 Pipe Insulation Materials:

2.3.1 Flexible Unicellular Pipe Insulation: ASTM C534, Type I. (Tubular, suitable for use to 200°F.) Inside diameter shall be sized for the piping or tubing being insulated.

2.3.2 Staples, Bands, Wires, and Cement: As recommended by the insulation manufacturer for applications indicated.

2.3.3 Adhesives, Sealers, Protective Finishes: Products recommended by the insulation manufacturer for the application indicated.

2.3.4 Jackets: ASTM C921, Type I (vapor barrier) for piping below ambient temperature, Type II (vapor permeable) for piping above ambient temperature. Type I may be used for all piping at Installer's option.

3 EXECUTION3.1 General:

- 3.1.1 Install thermal insulation products in accordance with manufacturer's written instructions, and in compliance with recognized industry practices to ensure that insulation serves intended purpose.
- 3.1.2 Install insulation materials with smooth and even surfaces and on clean and dry surfaces. Redo poorly fitted joints. Do not use mastic or joint sealer as filler for gapping joints and excessive voids resulting from poor workmanship.
- 3.1.3 Maintain integrity of vapor-barrier on insulation and protect it to prevent puncture and other damage. Label all insulation "ASBESTOS FREE".
- 3.1.4 Do not apply insulation to surfaces while they are hot or wet.
- 3.1.5 Do not install insulation until systems have been checked and found free of leaks. Surfaces shall be clean and dry before attempting to apply insulation. A professional insulator with adequate experience and ability shall install insulation.
- 3.1.6 Do not install insulation on pipe systems until acceptance tests have been completed except for flexible unicellular insulation. Do not install insulation until the building is "dried-in".
- 3.2 Flexible Unicellular Pipe Insulation:
- 3.2.1 Insulate the following piping systems:
  - 3.2.1.1 Condensate drains from air conditioning units - ½" thick.
  - 3.2.1.2 Refrigerant piping - ¾" thick.
  - 3.2.1.3 Air compressor after-cooler piping - ¾" thick.
- 3.2.2 Apply insulation in accordance with the manufacturer's recommendations and instructions. Mitre cut insulation to fit pipe fittings. Use approved cement to seal all joints and ends in the insulation.
- 3.2.3 Insulation outside the building shall be protected by a 0.016" thickness aluminum jacket with aluminum bands on 12" centers.

END OF SECTION

SECTION 15230/EXTERIOR INSULATION FOR DUCTWORK1 GENERAL

- 1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- 1.2 Division-15 Basic Mechanical Materials and Methods sections apply to work of this section.
- 1.3 Approval Submittals:
  - 1.3.1 Product Data: Submit producer's data sheets and installation instructions on each insulation system including insulation, coverings, adhesives, sealers, protective finishes, and other material recommended by the manufacturer for applications indicated. Submit for:
    - 1.3.1.1 Rigid duct insulation
    - 1.3.1.2 Flexible duct insulation
- 1.4 O&M Data Submittals: Submit a copy of all approval submittals. Include in O&M Manual.

2 PRODUCTS

- 2.1 Acceptable Manufacturers: Subject to compliance with requirements, provide insulation products by Knauf, Owens-Corning, Johns Manville, Certainteed.
- 2.2 Flame/Smoke Ratings: Provide composite mechanical insulation (insulation, coverings, sealers, mastic, and adhesive) with a flame spread rating of 25 or less, and a smoke-developed rating of 50 or less as tested by ANSI/ASTM 84.
- 2.3 Rigid Fiberglass Insulation Board: ASTM C612, Class 1 (non load bearing). Boards shall be 3 pcf density with UL rated aluminum foil vapor barrier (FSK).
- 2.4 Flexible Fiberglass Insulation: ASTM C553, Type I, Class B-3 (temperature less than 350°F). Duct wrap shall be 1 pcf density with UL rated aluminum foil vapor barrier (FSK).
- 2.5 General Purpose Mastic: Benjamin Foster 35-00 Series, Childers CP-10, or approved equal. The final selection of this product for the specific application indicated is the responsibility of the insulation supplier. The insulation system must meet the specified application.
- 2.6 Vapor Barrier Sealant: Benjamin Foster 30-65, Childers CP-34, or approved equal. Provide "Low Odor" type. Provide water-based product. The final selection of this product for the specific application indicated is the responsibility of the insulation supplier. The insulation system must meet the specified application.
- 2.7 Adhesive: Benjamin Foster 85-60, Childers CP-82, Childers CP-127, or approved equal. Provide water-based product. The final selection of this product for the specific application indicated is the responsibility of the insulation supplier. The insulation system must meet the



specified application.

- 2.8 Fiber-Glas Mesh: 10x10 Mesh. Foster Mastafab, Chil Glass #10 or equal.

### 3 EXECUTION

- 3.1 Insulate all supply, return and outdoor air ductwork exposed in mechanical rooms, mezzanines, fan lofts or in any finished spaces with 1½" thick rigid fiberglass insulation with vapor barrier.

#### 3.2 Installation of Rigid Insulation:

- 3.2.1 Clean and dry ductwork prior to insulating. Butt insulation firmly together to ensure complete and tight fit over surfaces to be covered. Install insulation materials with smooth and even surfaces. Maintain integrity of aluminum vapor barrier wherever possible. Extend insulation without interruption through walls, floors and similar ductwork penetrations except where otherwise indicated.

- 3.2.2 Adhere insulation to duct with 50 percent coverage using approved insulation adhesive applied in 6-inch wide swaths with 6-inch spaces between swaths. Additionally secure insulation with perforated pins and Tuff-Bond or by self-sticking pins with a 3/8" self-tapping screw. Space on 12-inch centers and 3 inches from all edges. Ducts up through 24" wide only require one row of pins. Ducts over 24" wide shall have pins spaced as described herein.

- 3.2.3 Apply open mesh glass fabric embedded in vapor barrier mastic. Then apply a second coat of general purpose mastic with aluminum grey color. This finish shall be complete over all rigid insulation.

- 3.3 Insulate all supply, return and outdoor air ductwork concealed above ceilings, in chases, or elsewhere, and the backs of all ceiling supply outlets with 2" thick fiberglass blanket insulation with vapor barrier.

#### 3.4 Installation of Flexible Insulation:

- 3.4.1 Insulate round elbows and fittings with wrap such that thickness is equal to adjoining duct covering. Clean and dry ductwork prior to insulating.

- 3.4.2 Adhere insulation to duct with 50 percent coverage using approved insulation adhesive applied in 6-inch wide swaths with 6-inch spaces between swaths. Additionally secure insulation with perforated pins and Tuff-Bond or by self-sticking pins with a 3/8" self-tapping screw. Space on 12-inch centers and 3 inches from all edges. Ducts up through 24" wide only require one row of pins. Ducts over 24" wide shall have pins spaced as described herein.

- 3.4.3 Lap all joints 2 inches and seal joints with 4-inch wide strips of open mesh glass fabric embedded in two coats of general purpose mastic.

- 3.4.4 Seal all punctures and breaks in aluminum vapor barrier with open mesh glass fabric and vapor barrier sealant.

END OF SECTION

SECTION 15405/POTABLE WATER SYSTEM1 GENERAL

- 1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- 1.2 Division-15 Basic Mechanical Requirements and Basic Mechanical Materials and Methods sections apply to work of this section.
- 1.3 Extent of potable water systems work, is indicated on drawings and schedules, and by requirements of this section.
- 1.4 Refer to appropriate Division-2 sections for exterior potable water system; not work of this section unless noted.
- 1.5 Insulation for potable water piping is specified in other Division-15 sections, and is included as work of this section. Insulation requirements include:
  - 1.5.1 Domestic hot water piping
- 1.6 Excavation and backfill required in conjunction with water piping is specified in other Division-15 sections, and is included as work of this section.
- 1.7 Code Compliance: Comply with applicable portions of Florida Building Code-Plumbing pertaining to selection and installation of plumbing materials and products. Comply with local utility requirements.
- 1.8 Approval Submittals:
  - 1.8.1 Product Data: Submit manufacturer's technical product data and installation instructions for:
    - 1.8.1.1 Valves
    - 1.8.1.2 Hose bibbs
    - 1.8.1.3 Wall hydrants
    - 1.8.1.4 Water hammer arresters
    - 1.8.1.5 Relief valves
    - 1.8.1.6 Trap primers
    - 1.8.1.7 Access doors
- 1.9 Test Reports and Verification Submittals:



- 1.9.1 Disinfection: Submit report by Health Department.
- 1.10 O&M Data Submittals: Submit a copy of all approval submittals. Submit maintenance data and parts lists for valves. Include these data in O&M manual.
- 2 PRODUCTS
- 2.1 General: Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, temperature ratings, and capacities as indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide materials and products complying with Florida Building Code - Plumbing where applicable. Provide sizes and types matching pipe materials used in potable water systems. Where more than one type of materials or products is indicated, selection is Installer's option.
- 2.2 Acceptable Manufacturers: Subject to compliance with requirements, provide products of one of the following listed for each item.
- 2.3 Identification: Provide identification complying with Division-15 Basic Mechanical Materials and Methods section "Mechanical Identification".
- 2.4 Pipes and Fittings: Provide pipes and pipe fittings complying with Division-15 Basic Mechanical Materials and Methods section "Pipes and Pipe Fittings", in accordance with the following listing:
- 2.4.1 Interior Water Piping:
- 2.4.1.1 Above Grade: Copper tube; Type L, hard-drawn temper; wrought-copper fittings, solder-joints.
- 2.4.1.2 Below Grade: Copper tube; Type L, soft-annealed temper; no joints below floor.
- 2.5 Piping Specialties: Provide piping specialties complying with Division-15 Basic Mechanical Materials and Methods section "Piping Specialties".
- 2.6 Supports and Anchors: Provide supports and anchors complying with Division-15 Basic Mechanical Materials and Methods section "Supports and Anchors".
- 2.7 Interior Valves: Provide valves complying with Division-15 Basic Mechanical Materials and Methods section "Valves", in accordance with the following listing:
- 2.7.1 Sectional and Shutoff Valves: BA1, BA2.
- 2.7.2 Drain Valves: BA1, BA2.
- 2.7.3 Check Valves: CK1, CK2, CK3.
- 2.8 Exterior Valves: Provide as indicated, gate valves, AWWA C500, 175 psi working pressure. Provide threaded, flanged, hub, or other end configurations to suit size of valve and piping connections. Provide inside screw type for use with curb valve box, iron body, bronze-mounted, double disc, parallel seat, non-rising stem. Clow Corp., Dresser Mfg., Fairbanks Co., Kennedy,



Stockham.

- 2.9 Hose Bibbs: Provide rough nickel plated hose bibbs with lock shield compression stop and removable handle, solid flange, female connection with 3/4" male threaded hose end, and straight line type non-removable vacuum breaker with 3/4" male threaded hose end. Acorn 8121 RCP or equal model by Woodford.
- 2.10 Non-freeze Wall Hydrants: Provide 3/4" anti-syphon, non-freeze wall hydrant with bronze casing, satin bronze box, straight inlet connection, and integral vacuum breaker-backflow preventer, Wade W-8625 or approved equal.
- 2.11 Water Hammer Arresters: Provide bellows type water hammer arresters, stainless steel casing and bellows, pressure rated for 250 psi, tested and certified in accordance with PDI Standard WH-201. Precision Plumbing Products, Josam, Zurn, Amtrol, Wade, Jay R. Smith, or approved equal.
- 2.12 Combined Pressure-Temperature Relief Valves: Provide relief valves as indicated, of size and capacity as selected by Installer for proper relieving capacity, in accordance with ASME Boiler and Pressure Vessel Code. Provide bronze body, test lever and thermostat complying with ANSI Z21.22 listing requirements for temperature discharge capacity. Provide temperature relief at 210°F, and pressure relief at 150 psi. Watts, Cash, Zurn, or approved equal.
- 2.13 Trap Primers: Provide brass trap primers and distribution units to seal floor drains indicated on drawings. Trap primer valves shall be automatic, self contained type with no springs or diaphragms and shall not require adjustment. Trap primer valves shall be the type that can be installed anywhere on cold water piping. Distribution units shall supply 1-4 floor drains. Trap primer valves shall comply with ASSE 1018. Precision Plumbing Products PR-500, or approved equal. Where P-trap primers are indicated use "Prime-Eze" by Jay R. Smith, or approved equal.
- 2.14 Access Doors: Provide access doors to service all valves and other devices as required in accordance with Division-15 Basic Materials and Methods Section "Access Doors".

### 3 EXECUTION

- 3.1 General: Examine areas and conditions under which potable water systems are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.
- 3.2 Install mechanical identification in accordance with Division-15 Basic Mechanical Materials and Methods section "Mechanical Identification".
- 3.3 Install water distribution piping in accordance with Division-15 Basic Mechanical Materials and Methods section "Pipes and Pipe Fittings".
- 3.3.1 Install piping with 1/32" per foot (1/4%) downward slope towards drain point.
- 3.3.2 Locate groups of pipes parallel to each other, spaced to permit applying full insulation and servicing of valves.

- 3.4 Install piping specialties in accordance with Division-15 Basic Mechanical Materials and Methods section "Piping Specialties".
- 3.5 Install supports and anchors in accordance with Division-15 Basic Mechanical Materials and Methods section "Supports and Anchors".
- 3.6 Install valves in accordance with Division-15 Basic Mechanical Materials and Methods section "Valves".
  - 3.6.1 Sectional Valves: Install on each branch and riser, close to main, where branch or riser serves two or more plumbing fixtures or equipment connections, and elsewhere as indicated.
  - 3.6.2 Shutoff Valves: Install on inlet of each plumbing equipment item, and on inlet of each plumbing fixture, and elsewhere as indicated.
  - 3.6.3 Drain Valves: Install on each plumbing equipment item located to completely drain equipment for service or repair. Install at base of each riser, at base of each rise or drop in piping system, and elsewhere where indicated or required to completely drain potable water system.
  - 3.6.4 Check Valves: Install where indicated.
- 3.7 Hose Bibbs and Wall Hydrants: Install on concealed piping where indicated with vacuum breaker. Provide shutoff valve at inlet. Mount 18 inches above grade or finished floor.
- 3.8 Install relief valves on each water heater, and where indicated in accordance with the manufacturer's instructions. Pipe untrapped, full size outside or to floor drain. Terminate discharge with a visible air gap or air gap fitting in the same room as the water heater. Cut the end of the pipe at a 45° angle and terminate 6 inches above the floor or grade.
- 3.9 Piping Runouts to Fixtures: Provide hot and cold water piping runouts to fixtures of sizes indicated, but in no case smaller than required by Florida Building Code-Plumbing.
- 3.10 Mechanical Equipment Connections: Connect hot and cold water piping system to mechanical equipment as indicated, and comply with equipment manufacturer's installation instructions. Provide shutoff valve and union for each connection, provide drain valve on drain connection.
- 3.11 Install water hammer arresters in upright position, in locations and of sizes indicated in accordance with PDI Standard WH-201.
- 3.12 Install air chambers at each fixture (or group of fixtures if the farthest fixture is within 6 feet of an air chamber). Air chambers shall be 20 pipe diameters long, but in no case less than 12 inches long.
- 3.13 Install trap primers as indicated, and in accordance with manufacturer's installation instructions. Provide access panels to all trap primers unless accessible through a lay-in ceiling.
- 3.14 Locate and coordinate installation of access doors for all valves and devices in accordance with

Division-15 Basic Mechanical Materials and Methods section "Access Doors".

3.15 Piping Tests: Test, clean, and sterilize potable water piping in accordance with testing requirements of Division-15 Basic Mechanical Materials and Methods section "Testing, Cleaning, and Sterilization of Piping Systems".

3.16 O&M Training: Provide four hours in one session.

END OF SECTION





SECTION 15410/SOIL, WASTE AND VENT SYSTEM1 GENERAL

- 1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- 1.2 Division-15 Basic Mechanical Requirements and Basic Mechanical Materials and Methods sections apply to work of this section.
- 1.3 Extent of soil waste and vent systems work is indicated on drawings and schedules, and by requirements of this section.
- 1.4 Refer to appropriate Division-2 sections for exterior sanitary sewer system required in conjunction with soil and waste systems; not work of this section.
- 1.5 Insulation for soil and waste systems is specified in other Division-15 sections, and is included as work of this section. Insulation requirements include:
  - 1.5.1 Horizontal or vertical above grade waste pipes receiving discharge from ice machines, coolers, freezers or similar units to points of connection receiving waste from 4 or more fixtures.
  - 1.5.2 Horizontal or vertical above grade waste pipes receiving condensate from air conditioning equipment to point of connection receiving waste from 4 or more fixtures.
- 1.6 Excavation and backfill required in conjunction with soil, waste and vent piping is specified in other Division-15 sections and is included as work of this section.
- 1.7 Refer to Division-7 section "Flashing and Sheet Metal" for flashings required in conjunction with soil and waste systems; not work of this section.
- 1.8 Code Compliance: Comply with applicable portions of Florida Building Code-Plumbing pertaining to plumbing materials, construction and installation of products. Comply with local utility requirements.
- 1.9 Approval Submittals:
  - 1.9.1 Product Data: Submit manufacturer's technical product data for:
    - 1.9.1.1 Cleanouts
    - 1.9.1.2 Floor drains
  - 1.10 O&M Data Submittals: Submit a copy of all approval submittals. Include these data in O&M manual.

2 PRODUCTS

- 2.1 General: Provide piping materials and factory-fabricated piping products of sizes, types, pressure

ratings, and capacities as indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide sizes and types matching piping and equipment connections; provide fittings of materials which match pipe materials used in soil and waste systems. Where more than one type of materials or products is indicated, selection is Installer's option.

Underground-Type Plastic Line Marker: Manufacturer's standard permanent, bright-colored, continuous-printed plastic tape, intended for direct-burial service; not less than 6" wide x 4 mils thick. Provide green tape with black printing reading "CAUTION SEWER LINE BURIED BELOW".

- 2.2 Acceptable Manufacturers: Subject to compliance with requirements, provide products of one of the following listed for each item.
- 2.3 Pipes and Fittings: Provide pipes and pipe fittings complying with Division-15 Basic Mechanical Materials and Methods section "Pipes and Pipe Fittings", in accordance with the following listing:
- 2.3.1 Above Ground Soil, Waste, and Vent Piping:
- 2.3.1.1 Polyvinyl chloride plastic pipe (PVC); Type DWV; PVC plastic type DWV socket-type fitting, solvent cement joints. Do not use in fire-rated assemblies or return air plenums.
- 2.3.2 Underground Building Drain Piping (within 5 feet of the building):
- 2.3.2.1 Pipe Size 6" and Smaller: Polyvinyl chloride sewer pipe (PVC); Type DWV; PVC plastic type DWV socket-type.
- 2.4 Pipe Specialties: Provide piping specialties complying with Division-15 Basic Materials and Methods section "Piping Specialties".
- 2.5 Supports and Anchors: Provide supports and anchors complying with Division-15 Basic Mechanical Materials and Methods section "Supports and Anchors".
- 2.6 Cleanouts: Provide factory-fabricated drainage piping products of size and type indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements and governing regulations. Josam, Jay R. Smith, Wade, Zurn, Watts.
- 2.6.1 Cleanout Plugs: Cast-bronze or brass, threads complying with ANSI B2.1 countersunk head.
- 2.6.2 Cleanout for PVC Systems:
- 2.6.2.1 Floor Cleanouts: Cast-iron body with adjustable head, brass plug, and scoriated nick-brass cover. Furnish with clamping ring for floors with membrane. Wade W-6030 hub outlet for push-on.
- 2.6.2.2 Cleanouts in Piping: PVC cleanout adaptor with threaded PVC plug.
- 2.6.2.3 Wall Cleanouts: PVC cleanout adaptor with tapped, countersunk, threaded brass plug and round stainless steel access cover with screw. Wade W-840-R-75. Add same as above here.



- 2.6.2.4 Grade Cleanouts: PVC cleanout adaptor with countersunk, threaded brass plug. Wade W-8590-D plug. In sidewalks and other finished concrete, provide access cover frames with a non-tilting tractor cover. Wade W-7035-Z or equal.
- 2.7 Floor Drains: Provide floor drains of size as indicated on drawings; and type, including features, as specified herein. Josam, Jay R. Smith, Wade, Zurn, Watts.
- 2.7.1 Floor Drains: Provide inside caulk bottom outlet or TY-Seal hub outlet with adaptor for cast iron trap installation and a 4" deep trap seal. Provide clamping rings for floors with membrane.
- 2.7.2 Strainer: Provide 5" round satin-nickel bronze strainer.
- 2.7.3 Trap Primer Connection: Provide ½" trap primer tapping.
- 2.7.4 Funnel: Provide funnel where shown on the drawings.
- 2.7.5 Basis of Design: Wade Series 1100.
- 3 EXECUTION
- 3.1 Examine substrates and conditions under which soil and waste systems are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.
- 3.2 Piping Installation:
- 3.2.1 Install above grade soil and waste piping in accordance with Division-15 Basic Mechanical Materials and Methods section "Pipes and Pipe Fittings", and with Florida Building Code-Plumbing.
- 3.2.2 Install underground soil and waste pipes as indicated and in accordance with Florida Building Code-Plumbing. Lay underground piping beginning at low point of systems, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install required gaskets in accordance with manufacturer's recommendations for use of lubricants, cements, and other special installation requirements. Clean interior of piping of dirt and other superfluous material as work progresses. Maintain swab or drag in line and pull past each joint as it is completed. Place plugs in ends of uncompleted piping at end of day or whenever work stops.
- 3.2.3 Install building soil and vent piping pitched to drain at minimum slope of ¼" per foot (2%) for piping 3" and smaller, and 1/8" per foot (1%) for piping 4" and larger.
- 3.3 Install piping specialties in accordance with Division-15 Basic Mechanical Materials and Methods section "Piping Specialties".
- 3.4 Install supports and anchors in accordance with Division-15 Basic Mechanical Materials and Methods section "Supports and Anchors".
- 3.5 Installation of Cleanouts: Install in above ground piping and building drain piping as indicated,

as required by Florida Building Code-Plumbing; and at each change in direction of piping greater than 45°; at minimum intervals of 100'; and at base of each vertical soil or waste stack. Install floor and wall cleanout covers for concealed piping, select type to match adjacent building finish.

- 3.5.1 Size: Cleanouts shall be full size up to 4". Piping over 4" shall have a reducing fitting to accommodate a 4" cleanout unless indicated otherwise on drawings.
- 3.5.2 Install cleanouts to allow adequate clearance for rodding. Cleanouts on piping 6" and smaller piping shall have a minimum of 18" clearance; cleanouts on piping 8" and larger shall have 36" clearance.
- 3.5.3 Protect all finished surfaces of cleanouts with a suitable adhesive covering until construction is completed.
- 3.5.4 Cleanouts to Grade: Provide an 18" x 18" x 8" thick concrete pad around the cleanout. Set the cleanout ferrule, adapter, or access cover frame in the concrete as required. The cleanout shall be extended to the finished grade. The concrete pad shall slope away from the cleanout in all directions approximately one inch. Cover pad with fill to finished grade.
- 3.5.5 Cleanouts in Paved Areas: Provide concrete pad similar to cleanout to grade and coordinate concrete depth at site with adjustable flange. Access cover frames are required.
- 3.6 Flashing Flanges: Install flashing flange and clamping device with each stack and cleanout passing through waterproof membranes.
- 3.7 Vent Flashing Sleeves: Install on stack passing through roof, secure to stack flashing in accordance with manufacturer's instructions. For metal roofs, sleeves and flashing are by Division-7.
- 3.8 Installation of Floor Drains: Install floor drains in accordance with manufacturer's written instructions and in locations indicated.
  - 3.8.1 Coordinate flashing work with work of waterproofing and adjoining substrate work.
  - 3.8.2 Install floor drains at low points of surface areas to be drained, or as indicated. Set tops of drains flush with finished floor.
  - 3.8.3 Install drain flashing collar or flange so that no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes, where penetrated.
  - 3.8.4 Position drains so that they are accessible and easy to maintain.
- 3.9 Connection of Trap Primers: Connect trap primers as indicated, and in accordance with manufacturer's installation instructions. Pitch piping towards drain trap, minimum of 1/8" per foot (1%). Adjust trap primer for proper flow.
- 3.10 Piping Runouts to Fixtures: Provide soil and waste piping runouts to plumbing fixtures and drains, with approved trap, of sizes indicated, but in no case smaller than required by Florida Building Code-Plumbing.