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232113 - Hydronic Piping

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SECTION 23 2113 - HYDRONIC PIPING

1.1 SUMMARY

A. Section Includes:

1. Copper tube and fittings.
2. Steel pipes and fittings.
3. Ductile-iron pipe and fittings.
4. Plastic pipe and fittings.
5. Transition fittings.
6. Conduit piping system.
7. Cased piping system.

B. See Chapter 5, Division 01, Section 017700.1.1.B.1.i Closeout Procedures - Project Record Documents for equipment list requirements for all equipment provided in this section.

1.2 QUALITY ASSURANCE

A. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.

1.3 COPPER TUBE AND FITTINGS

A. Drawn-Temper Copper Tubing: ASTM B 88, Type L (ASTM B 88M, Type B) or ASTM B 88, Type M (ASTM B 88M, Type C).

B. Wrought-Copper Fittings: ASME B16.22.

C. Wrought-Copper Unions: ASME B16.22.

D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

E. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for joining copper with copper; or BAg-1, silver alloy for joining copper with bronze or steel.

1.4 GROOVED OR PRESSED COPPER AND STEEL TUBE AND FITTINGS

A. Grooved copper or steel tube: Grinnell or Victaulic. Pressed fittings are only allowed for limited temporary/emergency repairs, and where they are installed they need to be replaced with

soldered or grooved fittings within one year. Viega “ProPress” and “Mega-Press” are examples of pressed fittings and must have prior UNH approval for use.

1.5 STEEL PIPES AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black or galvanized with plain ends; type, grade, and wall thickness as indicated in "Piping Application" Article.

B. Cast-Iron, Threaded Fittings: ASME B16.4; Class 125 and Class 250.

C. Malleable-Iron, Threaded Fittings: ASME B16.3, Class 150 and Class 300.

D. Malleable-Iron Unions: ASME B16.39; Class 150, Class 250, and Class 300.

E. Cast-Iron Pipe Flanges and Flanged Fittings: ASME B16.1, Class 125 and Class 250; raised ground face, and bolt holes spot faced.

F. Wrought-Steel Fittings: ASTM A 234/A 234M, wall thickness to match adjoining pipe.

G. Wrought Cast- and Forged-Steel Flanges and Flanged Fittings: ASME B16.5, including bolts, nuts, and gaskets of the following material group, end connections, and facings:

1. Material Group: 1.1.
2. End Connections: Butt welding.
3. Facings: Raised face.

H. Steel Welding Fittings: ASME B16.9 and ASTM A 234/A 234M, seamless or welded.

1. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

I. Grooved or Pressed Pipe Couplings for Galvanized-Steel Piping: AWWA C606 for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gaskets suitable for hot and cold water, and bolts and nuts.
1. Acceptable manufacturers include Grinnell, Viega, or Victaulic, including valves, accessories and circuit balancing valves only with prior UNH approval.

J. Nipples: ASTM A 733, made of same materials and wall thicknesses as pipe in which they are installed.

K. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch (3.2-mm) maximum thickness unless thickness or specific material is indicated.

    a. Full-Face Type: For flat-face, Class 125, cast-iron and -bronze flanges.
    b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

L. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

1.6 DUCTILE-IRON PIPE AND FITTINGS

A. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151/A21.51, with mechanical-joint bell and plain spigot end.

1. Standard-Pattern, Mechanical-Joint Fittings: AWWA C110/A21.10, ductile or gray iron.
2. Compact-Pattern, Mechanical-Joint Fittings: AWWA C153/A21.53, ductile iron.

    a. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

1.7 PLASTIC PIPE AND FITTINGS

A. CPVC Plastic:

1. Pipe: ASTM F 441/F 441M, Schedules 40 and 80, plain ends as indicated in "Piping Application" Article.
2. Pipe Fittings: Socket-type pipe fittings, ASTM F 438 for Schedule 40 pipe; ASTM F 439 for Schedule 80 pipe.
3. Solvent Cements: ASTM F 493.

    a. Use CPVC solvent cement that has a VOC content of 490 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
    b. Use adhesive primer that has a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. PVC Plastic:

1. Pipe: ASTM D 1785, Schedules 40 and 80, plain ends as indicated in "Piping Application" Article.
2. Pipe Fittings: Socket-type pipe fittings, ASTM D 2466 for Schedule 40 pipe; ASTM D 2467 for Schedule 80 pipe.
3. Solvent Cements: ASTM D 2564. Include primer according to ASTM F 656.

    a. Use PVC solvent cement that has a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

b. Use adhesive primer that has a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.

1.8 TRANSITION FITTINGS

A. Plastic-to-Metal Transition Fittings: CPVC and PVC one-piece fitting with one threaded brass or copper insert and one Schedule 80 solvent-cemented-joint end.

B. All supply and return lines for fan coil units shall be stainless steel braided lines. PEX tubing shall not be used.

1.9 CONDUIT PIPING SYSTEM

A. Description: Factory-fabricated and -assembled, airtight and watertight, drainable, pressure-tested piping with conduit, inner pipe supports, and insulated carrier piping. Fabricate so insulation can be dried in place by forcing dry air through conduit.

1. Manufacturers:

a. Insul-Tek Piping Systems, Inc.
b. Perma-Pipe, Inc.
c. Rovanco Piping Systems, Inc.
d. Thermacor Process, L.P.

B. Carrier Pipe Insulation:

1. Mineral-Wool Pipe Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, 850 deg F (454 deg C) or Type II, 1200 deg F (649 deg C), Grade A.

a. Bands: ASTM A 666, Type 304, stainless steel, 3/4 inch (19 mm) wide, 0.020 inch (0.5 mm) thick.

2. Calcium Silicate Pipe Insulation: Flat-, curved-, and grooved-block sections of noncombustible, inorganic, hydrous calcium silicate with a non-asbestos fibrous reinforcement. Comply with ASTM C 533, Type I.

a. Bands: ASTM A 666, Type 304, stainless steel, 3/4 inch (19 mm) wide, 0.020 inch (0.5 mm) thick.

3. Polyisocyanurate Foam Pipe Insulation: Unfaced, preformed, rigid cellular polyisocyanurate material intended for use as thermal insulation.

a. Comply with ASTM C 591, Type I or Type IV, except thermal conductivity (k-value) shall not exceed 0.19 Btu x in./h x sq. ft. x deg F (0.027 W/m x K) at 75 deg F (24 deg C) after 180 days of aging.
b. Flame-spread index shall be 25 or less and smoke-developed index shall be 50 or less for thickness up to 1-1/2 inches (38 mm) as tested by ASTM E 84.
c. Fabricate shapes according to ASTM C 450 and ASTM C 585.

4. Polyurethane Foam Pipe Insulation: Unfaced, preformed, rigid cellular polyurethane material intended for use as thermal insulation.

a. Comply with ASTM C 591, Type I or Type IV, except thermal conductivity (k-value) shall not exceed 0.19 Btu x in./h x sq. ft. x deg F (0.027 W/m x K) at 75 deg F (24 deg C) after 180 days of aging.
b. Flame-spread index shall be 25 or less and smoke-developed index shall be 50 or less for thickness up to 1-1/2 inches (38 mm) as tested by ASTM E 84.
c. Fabricate shapes according to ASTM C 450 and ASTM C 585.

C. Minimum Clearance:

1. Between Carrier Pipe Insulation and Conduit: 1 inch (25 mm).
2. Between Insulation of Multiple Carrier Pipes: 3/16 inch (4.75 mm).
3. Between Bottom of Carrier Pipe Insulation and Conduit: 1 inch (25 mm).
4. Between Bottom of Bare, Carrier Pipe and Casing: 1-3/8 inches (35 mm).

D. Conduit: Spiral wound, steel.

1. Cover: With polyurethane foam insulation with an HDPE jacket; thickness indicated in "Piping Application" Article.
2. Piping Supports within Conduit: Corrugated galvanized steel with a maximum spacing of 10 feet (3 m).
3. Fittings: Factory-fabricated and -insulated elbows and tees. Elbows may be bent pipe equal to carrier pipe. Tees shall be factory fabricated and insulated, and shall be compatible with the carrier pipe.
4. Expansion Offsets and Loops: Size casing to contain piping expansion.
5. Accessories include the following:

a. Water Shed: Terminal end protector for carrier pipes entering building through floor, 3 inches (75 mm) deep and 2 inches (50 mm) larger than casing; terminate casing 20 inches (500 mm) above the floor level.
b. Guides and Anchors: Steel plate welded to carrier pipes and to casing, complete with vent and drainage openings inside casing.
c. End Seals: Steel plate welded to carrier pipes and to casing, complete with drain and vent openings on vertical centerline.
d. Gland Seals: Packed stuffing box and gland follower mounted on steel plate, welded to end of casing, permitting axial movement of carrier piping, with drain and vent connections on vertical centerline.
e. Joint Kit: Half-shell, pourable or split insulation and shrink-wrap sleeve.

E. Manholes: Black steel with lifting eyes.

1. Finish: Spray-applied urethane, minimum 30 mils (0.75 mm) thick.
2. Access: 30-inch- (750-mm-) diameter waterproof cover with gasket, ladder, and two 6-inch (150-mm) vents, one high and one low, extending above grade with rain caps.
3. Conduit Stub-Outs and Seals: Welded steel with drain and vent openings.
4. Sump: 12 inches (300 mm) in diameter, 12 inches (300 mm) deep.
5. Floatation Anchor: Oversized bottom keyed into concrete base.

F. Source Quality Control: Factory test conduit to 15 psig (105 kPa) for a minimum of two minutes with no change in pressure. Factory test carrier pipe to 150 percent of the operating pressure of system. Furnish test certificates.

1.10 CASED PIPING SYSTEM

A. Description: Factory-fabricated piping with carrier pipe, insulation, and casing.

1. Manufacturers:

a. Insul-Tek Piping Systems, Inc.
b. Perma-Pipe, Inc.
c. Rovanco Piping Systems, Inc.
d. Thermacor Process, L.P.
e. Thermal Pipe Systems.
f. Urecon Ltd.

B. Carrier Pipe Insulation:

1. Polyurethane Foam Pipe Insulation: Rigid, cellular, high-pressure injected between carrier pipe and jacket.

a. Comply with ASTM C 591; thermal conductivity (k-value) shall not exceed 0.14 Btu x in./h x sq. ft. x deg F (0.020 W/m x K) at 75 deg F (24 deg C) after 180 days of aging.

C. Casing accessories include the following:

1. Joint Kit: Half-shell, pourable or split insulation, casing sleeve, and shrink-wrap sleeve.
2. Expansion Blanket: Elastomeric foam, formed to fit over piping.
3. End Seals: Shrink wrap the casing material to seal watertight around casing and carrier pipe.

D. Manholes: Black steel with lifting eyes.

1. Finish: Spray-applied urethane, minimum 30 mils (0.75 mm) thick.
2. Access: 30-inch- (750-mm-) diameter waterproof cover with gasket, ladder, and two 6-inch (150-mm) vents, one high and one low, extending above grade with rain caps.
3. Conduit Stub-Outs and Seals: Welded steel with drain and vent openings.
4. Sump: 12 inches (300 mm) in diameter, 12 inches (300 mm) deep.
5. Floatation Anchor: Oversized bottom keyed into concrete base.

E. Source Quality Control: Factory test the carrier pipe to 150 percent of the operating pressure of system. Furnish test certificates.

END OF SECTION 23 2113