SECTION 23.21.13
HYDRONIC PIPING

PART 1 - GENERAL

1.01 SECTION INCLUDES
A. Pipe and Pipe Fittings for:
   1. Hydronic Piping System
   2. Equipment Drains and Overflows.
B. Valves:
   1. Ball Valves
   2. Butterfly Valves.
   3. Check Valves
C. Cleaning for Existing Piping

1.02 RELATED SECTIONS
A. Section 220553: Mechanical Identification
B. Section 220719: Piping Insulation

1.03 REFERENCES
A. ASME B31.9 – Building Services Piping.
B. ASTM A53 – Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless.
C. ASTM A234 – Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.
D. ANSI/ASME B16.22 Wrought Copper and Bronze Solder-Joint Pressure Fittings.
E. ASTM B88 – Seamless Copper Water Tube
F. ANSI/AWWA C104/A21.4 Ductile Iron Pipe
G. ASTM D1785 – Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
J. MSS SP69 – Pipe Hangers and Supports – Selection and Application.

1.04 SYSTEM DESCRIPTION
A. Where more than one piping system materials is specified, ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.
B. Use grooved mechanical couplings and fasteners in accessible locations.
C. Use unions, flanges, and couplings downstream of valves and at equipment or apparatus connections. Do not use direct welded or threaded connections to valves, equipment or other apparatus.
D. Provide pipe hangers and supports in accordance with MSS SP69 unless indicated otherwise.
E. Use ball (2" and under) or butterfly (over 2") valves for shut-off and to isolate equipment, part of systems, or vertical risers.
F. Use ¾ inch ball valves with cap for drains at main shut-off valves, low points of piping, bases of vertical risers, and at equipment. Pipe to nearest floor drain.
**1.05 SUBMITTALS**

A. **Product Data:** Include data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalogue information. Indicate valve data and ratings.

**1.06 DELIVERY, STORAGE, AND PROTECTION**

A. Deliver, store, protect and handle products to site.
B. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
C. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

**1.07 EXTRA MATERIALS**

A. Provide two (2) repacking kits for each size and valve type.

**PART 2 - PRODUCTS**

**2.01 HYDRONIC PIPING**

A. **Steel Pipe:** ASTM A53, Schedule 40, black.
   1. **Fittings:** ASTM B16.3, malleable iron or ASTM A234, forged steel welding type fittings.
   2. **Joints:** Threaded, or AWS D1.1, welded.
B. **Copper Tubing:** ASTM B88, Type L, hard drawn:
   1. **Fittings:** ANSI/ASME B16.3 150 psig malleable iron, or ASTM A234 forged steel welding type.
   2. **Joints:** Screwed type for up to 2", welded over 2".
C. **Buried Piping - Pre-manufactured:**
   1. **Carrier pipe:** Schedule 40, carbon steel A-53B ERW, welded. For sizes less than or equal to 4" diameter, SDR11 High Density Polyethylene pipe suitable for temperatures up to 140°F at 80 psi and 74°F at 160 psi.
   2. **Carrier pipe insulation:** Carrier pipe insulation is hi-temp foam insulation K Factor of .165 density 2 PCF, closed cell content 90%, compressive strength of 35 PSI, and carrier temperature of 300°F and shall conform to ASTM standard D1621, 1622, 1623, 2126, 2842, 2856, and C518-91. Minimum thickness shall be 1.6 inches.
   3. **Jacketing:** The outer protective jacket shall be 175 mil corrugated seamless polyethylene completely encompassing and protecting the insulation from moisture and damage, designed for H-20 loading at a burial depth of 2-ft minimum.
   4. **Fittings:** All fittings will conform to pipe type and will be insulated and jacketed with materials supplied by the system supplier as per manufacturer’s standard procedure.
   5. **Expansion Loops and Elbows:** Expansion loops, elbows and other fittings shall be pre-fabricated and furnished in the same types and thickness of insulation and jacketing as those for the straight section of the piping system. They will be of a size to permit expansion and contraction without damage to the insulation material. All fittings, expansion loops and elbows shall be provided as necessary in accordance with computerized stress analysis provided by manufacturer.
   6. **Seals:** Each length of pre-insulated pipe will be fitted with a watertight mastic end seal at jacket and pipe surfaces. All field cuts will be sealed with a field applied end seal.
   7. **Manufacturers:** Perma-Pipe, Rovanco, Thermacor.

**2.02 EQUIPMENT DRAINS AND OVERFLOWS**

A. **PVC Pipe:** ASTM D1785, Schedule 40, or ASTM D2241, SDR 21 or 26.
   1. **Fittings:** ASTM D2466 or D2467, PVC.
   2. **Joints:** ASTM D2855, solvent weld.
2.03 PIPE HANGERS AND SUPPORTS
A. Conform to MSS SP69.
B. Hangers for Pipe Sizes ½ to 1 ½ Inch: Carbon steel, adjustable swivel, split ring.
C. Hangers for Hot Pipe Sizes 2 to 4 Inches: Carbon steel, adjustable, clevis.
D. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
E. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
F. Vertical Support: Steel riser clamp.
G. Floor Support for Hot Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
H. Hanger Roads: Mild steel threaded both ends, threaded one end or continuous threaded.
I. Inserts: Malleable iron case of steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.04 UNIONS, FLANGES, AND COUPLINGS
A. Unions for Pipe 2 Inches and Under
   1. Ferrous Piping: 150 psig malleable iron, threaded.
B. Flanges for Pipe Over 2 Inches
   1. Ferrous Piping: 150 psig forged steel, slip-on.
   2. Gaskets: 1/16 inch thick performed neoprene.
C. Grooved and Shouldered Pipe End Couplings
   1. Housing Clamps: Malleable iron to engage and lock, designed to permit some angular deflection, contraction, and expansion.
   2. Sealing Gasket: C-shape elastomer composition.
   3. Accessories: Steel bolts, nuts, and washers.
D. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.05 BALL VALVES
A. Up to and Including 2 Inches
   1. Bronze two (2) piece body, chrome plated brass ball, teflon seats and stuffing box ring, lever handle threaded ends.

2.06 BUTTERFLY VALVES
A. Over 2 Inches
   1. Cast Iron, wafer style or lug style for deadend, EPDM seat, stainless steel disc.

2.07 CHECK VALVES
A. Up to and Including 2 Inches
   1. Bronze body, bronze trim, bronze rotating disc, with composition disc, threaded ends.
B. Over 2"
   1. "Soft" check valves required.

PART 3 – EXECUTION

3.01 PREPARATION
A. Ream pipe and tube ends. Remove burrs.
B. Remove scale and dirt on inside and outside before assembly.
C. Prepare piping connections to equipment with flanges or unions.
D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

### 3.02 INSTALLATION

A. Install in accordance with manufacturer’s instructions.
B. Install piping to ASME B31.9 and ASME B31.5.
C. Route piping in orderly manner, parallel to building structure, and maintain gradient.
D. Install piping to conserve building space, and not interfere with use of space.
E. Group piping whenever practical at common elevations.
F. Sleeve pipe passing through partitions, walls and floors.
G. Slope piping and arrange to drain at low points.
H. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

#### I. Inserts:
1. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
2. Where concrete slabs form finished ceiling, located inserts flush with slab surface.
3. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.

#### J. Pipe Hangers and Supports:
1. Install in accordance with MSS SP69.
2. Support horizontal piping as scheduled.
3. Install hangers to provide minimum ½ inch space between finished covering and adjacent work.
4. Place hangers within 12 inches of each horizontal elbow.
5. Use hangers with 1 ½ inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
8. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

#### K. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 220719.

L. Provide access where valves and fittings are not exposed.

M. Slope piping and arrange system to drain at low points. Use eccentric reducers to maintain top of pipe level.

N. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.

O. Install valves with steam upright or horizontal, not inverted.

P. The installation of pre-insulated buried piping shall be made in accordance with plans, specifications, and manufacturer’s installation instructions. System supplier will provide an installation instructor on site to train the contractor on all phases of installation and witness testing.
3.03 **INSULATION AND FREEZE PROTECTION**
A. See Section 220719 – Piping Insulation.

3.04 **SCHEDULES**
A. Pipe Hanger Spacing
B.

<table>
<thead>
<tr>
<th>PIPE SIZE INCHES</th>
<th>HANGER ROD MAXIMUM HANGER SPACING</th>
<th>DIAMETER INCHES</th>
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<tr>
<td>½ to 1 ¼</td>
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<tr>
<td>1 ½ TO 2</td>
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<tr>
<td>2 ½ TO 6</td>
<td>10</td>
<td>½</td>
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3.05 **CLEANING**
A. Contractor shall clean existing hydronic systems in buildings associated with this project with the following procedures:
1. Contractor shall submit a flushing plan for approval.
2. If no flushing points are available, the contractor shall install flush points at no additional charge.
3. The contractor is responsible for obtaining and costs for water used for flushing.
4. Flushing shall be of sufficient magnitude to flush foreign material from piping, valves, etc. all valves shall be exercised during flushing. A minimum of 2.5 FPS is required for flushing.
5. Contractor must install temporary backflow prevention of any potable connections may be compromised.
6. All strainers shall be cleaned and water replaced when flushing is completed.

**END OF SECTION**