SECTION 23.22.13
STEAM AND CONDENSATE PIPING

PART 1 - GENERAL

1.01 SECTION INCLUDES
A. Pipe and Pipe Fittings
B. Valves
C. Steam Piping System.
D. Steam Condensate Piping System
E. Anchors

1.2 RELATED SECTIONS - NOT USED

1.3 REFERENCES
A. ASME – Boilers and Pressure Vessel Codes, SEC 9 – Qualification Standards for Welding and Brazing Procedures, Welders, Brazers, and Welding and Brazing Operators.
B. ASME B16.3 Malleable Iron Threaded Fittings Class 150 and 300.
C. ASME B31.1 – Code for Power Piping.
D. ASME B31.9 – Building Services Piping.
E. ASTM A53 – Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.
F. ASTM A234 – Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.
G. ASTM F708 – Design and Installation of Rigid Pipe Hangers.
H. AWS D1.1 – Structural Welding Code.
I. MSS SP69 – Pipe Hangers and Supports – Selections and Application.

1.4 SYSTEM DESCRIPTION
A. When more than one piping system material is joined, ensure systems components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, unions, and couplings for servicing are consistently provided.
B. Use unions, flanges, and downstream of valves and at equipment or apparatus connections. Use dielectric unions where joining dissimilar materials. Do not use direct welded or threaded connections.
C. Provide pipe hangers and supports in accordance with MSS SP69 unless indicated otherwise.
D. Use gate or ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.
E. Use gate or ball valves for throttling, bypass, or manual flow control services.

1.5 SUBMITTALS
B. Computer Analysis: Provide system analysis of buried piping to include stresses on carrier pipe and anticipated thermal movement of service pipe.
1.6 QUALIFICATIONS
A. Installer: Company specializing in performing the work of this section with minimum three (3) years experience

1.7 REGULATORY REQUIREMENTS
A. Conform to ASME B31.9 code for installation of piping system.

1.8 DELIVERY, STORAGE, AND HANDLING
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.

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

PART 2 - PRODUCTS

2.1 MEDIUM PRESSURE STEAM PIPING (150 PSIG MAXIMUM)
A. Buried Piping - Pre-manufactured:
   2. Carrier pipe insulation: high temp insulation blanket of silica aerogel and reinforced with a non-woven, glass fiber batting. Sectional insulation shall be banded on pipe with aluminum banding on 18” center. Insulation thickness on carrier pipe so be so the external skin temperature of the overall system is less than 100 degrees F.
   3. Inner pipe supports: All pipe shall be aligned and supported within the inner conduit casing with galvanized steel supports spaced on 10’ centers. The carrier pipe shall bear directly on the steel support. The support shall be designed to permit drainage and free air passage. All pipe passing through supports shall be insulated.
   4. Inner conduit casing: Casing shall be 10 gauge black steel. The interior surface shall be smooth to permit free moisture drainage and removability of the inner assembly. The outer casing shall be sized to provide adequate annular space between the outer surface of the insulation material and the interior surface of the casing. Inner conduit casing field joint closures shall consist of 10 gauge steel and shall be field welded over adjacent units. Provide cathodic protection with flange isolation kit per manufacturer recommendation compatible with existing Perma-Pipe system. If the manufacturer will not acceptable and warrant such joint, replace steam pipe to inside the manhole with factory end closure of the conduit system.
   5. Inner conduit casing Insulation: Insulation shall be 1 3/4” minimum. High-temp polyisocyanurate insulation applied to the inner conduit casing shall have the following properties:
      Minimum Density: 2.0 pcf per ASTM D 1622
      Closed Cell Content: 90% per ASTM D 2856
      Compressive Strength: 30 PSI per ASTM D 1621

Insulation must be capable of handling intermittent temperature spikes to 450°F for 8-12 hours. Insulation must completely fill the annular space between the inner conduit casing and HDPE jacket. System supplier shall provide written temperature performance certification from foam insulation manufacturer and an independent Testing Agency Report.
and Certification that the insulation to be provided meets the above referenced performance standards.

6. **Outer Jacket:** The exterior protective jacket shall be heavyweight, seamless, high impact, polyethylene conforming to ASTM D1248 & D3350. Spray and wrapped polyethylene jackets are not considered to be seamless. Field joints shall be insulated on carrier and half shells of high temp polyisocyanurate foam for outer insulation. The outer polyethylene joint shall be certified EN 489 or equal method approved by engineer. Certification required during submittal. Joints must be air tested in a way that the polyethylene is not drilled into. Air test from the side of joint is recommended. Contractor to log each joint and present to owner at time of final test. 175 mil minimum Seamless HDPE casing required. No FRP jacket or electrofusion casing joints allowed.

7. **Expansion Loops, Elbows, and Anchors:** Expansion loops, expansion elbows and other fittings shall be pre-fabricated and furnished in the same types and thickness of insulation and casing as those for the straight section of the piping system. They will be of a size to permit the inner pipe or pipes to expand and contract without damage to the insulation material. Anchors shall be pre-fabricated onto the piping units and shall be equipped with drain and vent openings at the top and bottom of the anchor plate. Anchor plates shall be made of minimum ½” steel plate. All fittings, expansion loops, elbows, and anchors shall be provided as necessary in accordance with computerized stress analysis.

8. **Seals and corrosion protection overlay:** Terminal ends of conduit inside manholes, pits or buildings shall be equipped with end seals consisting of a steel bulkhead plate welded to the conduit and carrier pipe if there is an anchor within five feet of the end seal. Where there is no anchor within five feet of a terminal end, conduits shall be equipped with gland seals consisting of a high temp gasket and follower plate. End seals or gland seals shall be made of ½” steel plate with drain and vent openings on the vertical center line of the mounting plate. All exposed steel surfaces of the end seals and gland seals will be protected from corrosion with a 6-8 mils thickness of molten metal, resulting in an anodic metallic overlay. The steel surface must be shot blasted to a new white finish to SSPC-10.

9. **Manufacturers:** Perma-Pipe, Rovanco, Thermacor.

### 2.2 STEAM CONDENSATE PIPING

#### A. Buried Piping - Pre-manufactured:

1. **Carrier pipe:** Schedule 80, carbon steel A53, welded.
2. **Carrier pipe insulation:** High temp insulation blanket of silica aerogel and reinforced with a non-woven, glass fiber batting. Sectional insulation shall be banded on pipe with aluminum banding on 18” center. Insulation thickness on carrier pipe so be so the external skin temperature of the overall system is less than 100 degrees F.
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2.3 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 Pipe Sizes 2 to 4 Inches: Carbon steel, adjustable, clevis.
D. Multiple or Trapeze Hangers for Pipe Sizes to 4 Inches: Steel channels with welded spacers and hanger rods.
E. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
F. Wall Support for Pipe Sizes 4 to 5 Inches: Welded steel bracket and wrought steel clamp.

G. Vertical Support: Steel riser clamp.

H. Floor Support for Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

I. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.

J. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger roads.

2.4 UNION, 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 Teflon.

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

D. Provide cathodic protection with flange isolation kits compatible with Perma-Pipe.

2.5 GATE AND BUTTERFLY VALVES
A. Up To and Including 2 Inches - Gate Valves
   1. Iron body, bronze trim, bolted bonnet, rising stem, handwheel, outside screw and yoke, solid wedge disc with bronze seat rings, flanged ends. Manufacturers: FlowServe, Jamesbury, Nibco.

B. Over 2 Inches - Butterfly Valves
   1. Ductile cast iron Lugged Body, Carbon Steel; Gear Operator; ASTM A395; Rated 105 psi Differential Pressure in closed position; Stainless Steel Disc and Stem; TFE Seal and Packing, Teflon Coated Stainless Steel Shaft Bearings. Manufacturers: FlowServe, Jamesbury, Nibco.

2.6 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.

B. Over 2 Inches
   1. Cast steel body, chrome plated steel ball, teflon seat and stuffing box seals, lever handle, flanged.

2.7 SWING CHECK VALVES
A. Up To and Including 2 Inches
   1. Bronze or iron body, bronze trim, bronze rotating swing disc with composition seat, threaded ends.

B. Over 2 Inches
   1. Iron body, bronze trim, bronze or bronze faced rotating swing disc, renewable disc and seat, flanged ends.

2.8 TRAPS
A. Free-Float Ball Trap - float and thermostatic design. 250 psi rated at 450o F. Cast iron body, all

**PART 3 - EXECUTION**

### 3.1 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. Wherever work is suspended during construction protect open ends with temporary plugs or caps.

### 3.2 INSTALLATION

A. Install in accordance with manufacturer’s instructions.

B. 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.

C. Install piping to conserve space and not interfere with use of space. Route piping in orderly manner, plumb and maintain gradient.

D. Sleeve pipe passing through manhole walls.

E. Install piping to allow for expansion and contraction without stressing pipe.

F. Pipe Hangers and Supports
   1. Install in accordance with MSS SP69.
   2. Prime coat steel hangers and supports.

G. Provide clearance for installation of insulation and access to valves and fittings.

H. Provide drip leg with steam trap at elevation rises. Slope steam line toward drip leg and trap. Slope steam piping one inch in 40 feet (0.25 percent). Use eccentric reducers to maintain bottom of pipe level.

I. Slope steam condensate piping one (1) inch in 40 feet (0.25 percent). Provide drip trap assembly at low points.

J. Installed valves with stems upright or horizontal, not inverted.

### 3.3 SCHEDULES

A. Hanger Spacing for Steel Steam Piping:

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<th>MAXIMUM SPAN (FEET)</th>
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CONSTRUCTION DOCUMENTS PACKAGE

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B. Hanger Spacing for Steam Condensate Piping

END OF SECTION