

SECTION 23 21 13

HYDRONIC PIPING

This document is intended to note the Owners Design Requirements (ODR) for the titled specification section. Design professional to review and integrate ODR into the project's technical specifications. This ODR document should not be viewed as a standalone technical specification.

PART 1 - GENERAL REQUIREMENTS

N/A

PART 2 - PRODUCTS AND MATERIALS

♦ MANUFACTURERS

- Manufacturer: Subject to compliance with requirements, provide hydronic piping system products from one of the following:
 - Pressure Independent Balancing Valves
 - Belimo (larger AHUs)
 - Bray
 - Honeywell
 - Y-Pattern Strainers:
 - Sarco

♦ PIPE AND TUBING MATERIALS

- Drawn Temper Copper Tubing: ASTM B 88, Type L only, no Type K
- Steel Pipe:
 - NPS 2 and Smaller: ASTM A 53, Type S (seamless), Grade B, Schedule 40, black steel, plain ends.
 - NPS 2-1/2 through NPS 10 ASTM A 53, Type E (electric-resistance welded) or Type S (seamless), Grade B, Schedule 40, black steel, plain ends.
 - NPS 12 through NPS 24 ASTM A 53, Type E (electric-resistance welded) or Type S (seamless), Grade B, Schedule STD, black steel, plain ends.
 - Steel Pipe Nipples: ASTM A 733, made of ASTM A 53, Schedule 40, black steel; seamless for NPS 2 and smaller and electric-resistance welded for NPS 2-1/2 and larger.

♦ FITTINGS

- Cast-Iron Threaded Fittings: standard pattern, for threaded joints. Threads shall conform to ANSI B1.20.1.
- Malleable-Iron Threaded Fittings: ANSI B16.3, Class 150, standard pattern, for threaded joints. Threads shall conform to ANSI B1.20.1.
- Steel Fittings: ASTM A 234, seamless or welded, for welded joints.
- Wrought-Copper Fittings: ANSI B16.22, streamlined pattern.
- Stainless Steel Fittings: Fabricated of same material and thickness as piping for grooved coupling or butt welding.
- Cast-Iron Threaded Flanges: ANSI B16.1, Class 125; raised ground face, bolt holes spot faced.
- Cast Bronze Flanges: ANSI B16.24, Class 150; raised ground face, bolt holes spot faced.
- Steel Flanges and Flanged Fittings: ANSI B16.5, including bolts, nuts, and gaskets of the following material group, end connection and facing:
 - Material Group: 1.1.

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- End Connections: Butt Welding.
- Facings: Raised face.
- Unions: ANSI B16.39 malleable-iron, Class 150 for low pressure service and class 300 for high pressure service; hexagonal stock, with ball-and-socket joints, metal-to-metal bronze seating surfaces; female threaded ends. Threads shall conform to ANSI B1.20.1.
- Dielectric Unions: Provide factory-fabricated dielectric unions with copper and galvanized or black steel hexagonal two piece body, plastic isolation gasket and appropriate end connections for the pipe materials in which installed (screwed, soldered, or flanged) to effectively isolate dissimilar metals, prevent galvanic action, and stop corrosion.
- Dielectric Waterway Fittings: Provide electroplated steel or brass nipple, with an inert and non-corrosive, thermoplastic lining, with appropriate end connections for the pipe materials in which installed (screwed, soldered, or flanged) to effectively isolate dissimilar metals, prevent galvanic action, and stop corrosion.
- Dielectric Flanges and Flange Kits:
 - Full faced gasket with same outside diameter and bolt holes as the flange. Pressure rating of 175 psi at a temperature rating of 180F.
 - Steel washers, thermoplastic washers and bolt isolation sleeves or thermoplastic combination washers and bolt sleeves.
 - Flanges: Bronze Class 125 solder type, cast iron Class 125 threaded type or steel Class 150 welded type for low pressure service and bronze Class 250 solder type, cast iron Class 250 threaded type or steel Class 300 welded type for high pressure service.
- ◆ SPECIAL DUTY VALVES
 - Pressure Independent Balancing Valves: Valve shall be rated for 125 psig water working pressure, 250 deg F maximum operating temperature and shall be bronze body with plug or globe style valve and calibrated orifice. Provide with connections for portable differential pressure meter with integral check valves and seals. Valve shall have integral pointer and calibrated scale to register degree of valve opening. Valve shall have position indication readout and built-in memory stop for repeatable regulation and control. Valves 2 inch and smaller shall have threaded connections and 2-1/2 inch valves shall have flanged connections.
- ◆ HYDRONIC SPECIALTIES
 - Manual Air Vent: Manual air vents at heat transfer coils shall be bronze body and nonferrous internal parts; 150 psig working pressure, 225 deg F operating temperature; manually operated with screwdriver or thumbscrew; and having 1/8 inch discharge and inlet connections. Manual air vents in piping mains shall consist of a tee fitting, 1/2" ball valve, threaded nipple and cap.
 - Automatic Air Vent: Automatic air vents shall be designed to vent automatically with float principle; bronze body and nonferrous internal parts; 150 psig working pressure, 240 deg F operating temperature; and having 1/4 inch discharge connection and 1/2 inch inlet connection.
 - Y-Pattern Strainers: Strainers shall be rated for 125 psig working pressure and shall have perforated Type 304 stainless steel basket and bottom drain connection. For general piping strainers, screen openings shall be 0.062" perforations for 4" and smaller and 1/8" perforations for larger than 4". For strainers upstream of automatic flow control valves,

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screen openings shall be 20 mesh. Strainers, 2" and smaller, shall have cast bronze body (ASTM B-62), threaded connections and screwed cover. Strainers, larger than 2", shall have cast-iron body (ASTM A 126, Class B), flanged or grooved ends and bolted cover.

- Stainless-Steel-Hose/Steel Pipe, Flexible Connectors (Hydronic System equipment connections smaller than 4"): Corrugated, stainless-steel, inner tubing covered with stainless-steel wire braid. Include steel nipples or flanges, welded to hose.

PART 3 - EXECUTION

◆ PIPE APPLICATIONS

- Install Type L, drawn copper tubing with wrought copper fittings and solder joints for 2 inch and smaller, above ground, within building.
- Install steel pipe with threaded joints and fittings for 2 inch and smaller, and with welded joints for 2-1/2 inch and larger.

◆ PIPING INSTALLATIONS

- Use fittings for all changes in direction and all branch connections. Provide long radius elbows with a minimum centerline radius of 1-1/2 times the pipe diameter. Short radius elbows with a minimum centerline radius of 1 times the pipe diameter may be used only where space does not permit the long radius elbows.
- Install unions in pipes 2 inch and smaller, adjacent to each valve, at final connections each piece of equipment, and elsewhere as indicated. Unions are not required on flanged devices.
- Install dielectric unions for piping 2" and smaller or dielectric flanges for piping 2-1/2" and larger to connect piping materials of dissimilar metals in wet piping systems (except install dielectric waterway fittings instead of unions in concealed spaces) for the following installation conditions:
 - Copper connected to carbon or stainless steel.
- Install dielectric waterways for piping 2" and smaller for copper pipe connections to cast iron, carbon steel or stainless steel equipment connections, valves or fittings.
- Install dielectric flanges for piping 2-1/2" and larger for copper pipe connections to cast iron, carbon steel or stainless steel equipment connections, valves or fittings.
- Dielectric Flange Installation:
 - Provide brass nipples between the equipment connection and dielectric flange for screwed connections. Provide an iron flange for the equipment side and a bronze flange for the copper piping side of the joint.
 - Provide a bronze flange for the copper piping connection to a cast iron, ductile iron or steel flange.
 - Provide full face gasket.
 - Provide at each bolt, steel washers, thermoplastic washers and bolt isolation sleeves or thermoplastic combination washers and bolt sleeves.
- Install strainers on the supply side of each pressure reducing valve, pressure regulating valve, pump, and elsewhere as indicated. Install nipple and ball valve in blow down connection of strainers 2 inch and larger.

◆ HANGERS AND SUPPORTS

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◆ PIPE JOINT CONSTRUCTION

- Flanged Joints: Align flanges surfaces parallel. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using torque wrench.
- Joints Containing Dissimilar Metals: Provide dielectric unions for 2" and smaller and dielectric flanges for piping 2-1/2" and larger. Provide dielectric waterway fittings for 2" and smaller in concealed locations. Dielectric unions, waterway fittings and flanges are specified in Section "Basic Piping Materials and Methods".

◆ HYDRONIC SPECIALTIES INSTALLATION

- Install manual air vents at high points in the system, at heat transfer coils, and elsewhere as required for system air venting. Install a ball valve upstream of the air vent for maintenance and replacement.

◆ FIELD QUALITY CONTROL

- Preparation for testing:
 - Leave joints including welds uninsulated and exposed for examination during the test.
 - Provide temporary restraints for expansion joints which cannot sustain the reactions due to test pressure. If temporary restraints are not practical, isolate expansion joints from testing.
 - Flush system with clean water. Clean strainers.
 - Isolate equipment that is not to be subjected to the test pressure from the piping. If a valve is used to isolate the equipment, its closure shall be capable of sealing against the test pressure without damage to the valve. Flanged joints at which blinds are inserted to isolate equipment need not be tested.
 - Install relief valve set at a pressure no more than 1/3 higher than the test pressure, to protect against damage by expansion of liquid or other source of overpressure during the test.
 - Manufacturer shall field inspect and verify all hydronic balancing valves and pressure independent control valves meet scheduled pressures and flows prior to turnover to owner.
- Prior to pressure testing, notify CCDOA inspector:
 - Pressure test the piping system with air for 15 minutes at 10 psig with no observable loss in pressure; apply soapy water to all joints and look for signs of leaking within the 15 minutes. After a successful air pressure test, Pressure test with water for 2 hours at 225 psi with no observable loss in pressure. Use calibrated pressure gauges and disconnect the pump hose after reaching the required pressure and holding time.
 - Use vents installed at high points in the system to release trapped air while filling the system. Use drains installed at low points for complete removal of the liquid.
 - Examine system to see that equipment and parts that cannot withstand test pressures are properly isolated. Examine test equipment to ensure that it is tight and that low pressure filling lines are disconnected.

◆ ADJUSTING AND CLEANING

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- Clean and flush hydronic piping systems with clean water. Remove and clean or replace strainer screens. After cleaning and flushing hydronic piping system, but before balancing, remove disposable fine mesh strainers in pump suction diffusers.
- ♦ **STARTUP**
 - Check expansion tanks to determine that they are not air bound and that the system is completely full of water.
 - Before operating the system perform these steps:
 - Open valves to full open position. Close coil bypass valves.
 - Remove and clean strainers.
 - Check pump for proper direction of correct improper wiring.
 - Set automatic fill valves for required system pressure.
 - Check air vents at high points of systems and determine if all are installed and operating freely (automatic type) or to bleed air completely (manual type).
 - Set temperature controls so all coils are calling for full flow.
 - Check operation of automatic bypass valves.
 - Check and set operating temperatures of boilers, chillers, and cooling towers to design requirements.
 - Lubricate motors and bearings.

END OF SECTION