

Design Standard Hydronic Piping Systems

Purpose:

The hydronic piping systems are an essential element of the mechanical heating and cooling systems. This design standard has the purpose of creating a consistent application of hydronic piping system requirements throughout the East Side Union High School District therefore achieving a standard of quality for maintenance and reliability throughout all renovation and new building projects.

Design Standard:

Design and specify work to include materials, installation, and testing of pipes and pipe fittings for cooling tower water, chilled water, building heating water, make-up and drain, chemical treatment, and valves for a complete and operable system.

- Manual vents are standard but automatic vents can be considered in special situations. Where vent location is high or otherwise inaccessible, the following procedure can be followed: Install automatic valve at vent chamber, then extend 0.375-in. tubing to the nearest janitor sink or mechanical room floor drain and terminate with a ball valve. Use automatic water feed set to maintain proper system pressure. Glycol systems shall be equipped with a mix-and-fill tank with manual fill capabilities, hose bib from domestic water for tank filling, and tank level alarm. Direct-connect city makeup lines to glycol systems are NOT permitted.
- Provisions shall be made for draining and air venting of all water coils.
- Closed Loop Water Treatment: All new hot water and chilled water systems that are independent of the existing systems shall be arranged for shot feed chemical treatment. In each such system, the equivalent of one Nu-Calgon 100L Micromet pot feeder shall be provided, including pressure gage and flow indicator. The pot feeder to the system shall be hard-piped; using a hose is NOT acceptable.
- Open Tower Water Treatment: All new open loop cooling tower systems shall be provided with a non-chemical treatment system similar to the EnviroTower system.
- After all items of equipment have been connected to the system, the hot and chilled water system shall be chemically cleaned as follows:
 - Drain and refill the system using trisodium phosphate, 1 lb for every 50 gal in the system.
 - Fill, vent, and circulate the system with this solution, allowing it to reach design or operating temperatures.
 - After circulating a few hours (per manufacturer recommendations or best practice), the system should be drained completely, strainers removed and

cleaned, dirt legs and pockets opened and cleaned, and then refilled with fresh water.

- Reduced pressure principal backflow preventers shall be installed on all make-up water lines. Drains shall be piped to the nearest floor drain
- Chilled Water:
 - Pipe Sizes 2-1/2 Inches and Larger: Steel, Schedule 40 with welded or mechanical coupling fittings, copper tubing, type L.
 - Pipe Sizes, 2 Inches and Smaller: Steel, Schedule 40 with threaded fittings, copper tubing, type L.
 - Drain Pipe: Steel, Schedule 40, threaded fittings; copper tubing, type M, soldered fittings
- Heating Water:
 - Pipe Sizes 2-1/2 Inches and Larger: Steel, Schedule 40 with welded fittings, copper tubing, type L.
 - Pipe Sizes, 2 Inches and Smaller: Steel, Schedule 40 with threaded fittings, copper tubing, type L.
 - Drain Pipe: Steel, Schedule 40, threaded fittings; copper tubing, type M, soldered fittings
- Cooling Tower:
 - Pipe Sizes 2-1/2 Inches and Larger: Steel, Schedule 40 with welded, flanged or mechanical coupling fittings.
 - Pipe Sizes, 2 Inches and Smaller: Steel, Schedule 40 with threaded fittings, copper tubing, type L.
- Pressurized Steel Pipe:
 - ASTM A-53-84a, Electric Resistance Welded or Seamless, Grade B: Black, unless otherwise indicated, schedule as specified.
 - ASTM A-135-84, Schedule B: Black unless otherwise specified, schedule as specified
- Manual air vent valves.
 - Operated manually with screwdriver or thumbscrew, 1/8-inch NPS or 1/4-inch NPS connection as require
- Automatic air vent valves.
 - Float type with pressure rating equal to or greater than the system in which it is installed
- Automatic flow control valves.

- General: Pressure independent design, constructed to provide constant flow over a range of differential pressures, with field adjustable control point.
- Accuracy: Plus or minus 5 percent.
- Flow Characteristic. Smooth, continuous curve, void of abrupt changes over the entire range of operation.
- Construction: Brass body, EPDM O-ring seals, abrasion resistant and non-corrosive thermoplastic cartridge, 1/8-inch pressure ports.
- Flow adjustment: External adjustment via removable key and numeric dial indicator. Indicator reading to match manufacturer's data chart for calibration and flow reading
- Pressure/Temperature Rating: 230 PSIG/248F
- Strainers
 - Full line size strainers with ends matching connecting piping materials, machined screen seats, gasketed cap, blow off outlet, minimum 2-1/2 to 1 open area ratio, and Type 304 stainless steel screens with 1/16-inch diameter holes
- Air separators.
 - Line size, pressure rated for 125 PSI. Construct sizes 1-1/2 inches and smaller of cast iron, and sizes 2 inches and larger of steel complying with ASME Boiler and Pressure Code and stamped with the "U" symbol
- Expansion tanks.
 - Welded steel, constructed, tested and stamped in accordance with Section VIII of ASME Boiler and Pressure Vessel Code for working pressure of 125 PSI. Furnish National Board Form U-1 denoting compliance. Support vertical tanks with steel legs or base. Provide single flexible diaphragm securely sealed into tank to separate air charge from system water, to maintain design expansion capacity. Provide pressure gauge and air-charging fitting, and drain fitting. Diaphragm: Removable and replaceable in line
- Liquid flow switches.
 - Brass for all wetted parts, with packless construction, paddle with removable segments for pipe size and flow velocity, vaporproof electrical compartment for switches mounted on cold hydronic piping systems, switches for 115V, 60 Hz, 1-phase with 7.4A rating
- Water pressure relief valves.
 - Size and capacity as selected by installer for proper relieving capacity, in accordance with ASME Boiler and Pressure Vessel Code.

- Combined Pressure-Temperature Relief Valves: Bronze body, test lever, thermostat, complying with ANSI Z21.22 listing requirements for temperature discharge capacity. Provide temperature relief at 210F, and pressure relief at 125 PSI.
- Pressure Relief Valves: Bronze body, test lever, ASME rated. Provide pressure relief at 30 PSI
- Water pressure reducing valves.
 - Cast iron or brass body, inlet check valves, inlet strainer removable without system shut down, non-corrosive valve seat and stem factory set at operating pressure required
- Thermometers
 - 3-inch diameter bimetal dial thermometer, stainless steel case, white dial, black numbers, 4-inch stainless steel stem, brass separable socket. Back or bottom connections as required.

Service	Range
Heating Water	50 to 300F
Chilled Water	0 to 120F
Condenser Water	50 to 150F
- Thermometer wells
 - Brass or stainless steel, pressure rated to match piping system design pressure. Provide extensions for insulated piping of length required to extend above insulation used at each location. Provide cap nut with chain fastened permanently to thermometer well
- Pressure gages
 - Type: General use, 1 percent accuracy, ANSI B40.1, Grade A, phosphor bronze bourdon type, bottom connection.
 - Case: Drawn steel or brass, glass lens, 4-1/2-inch diameter.
 - Connector: Brass with 1/4-inch male NPT.
 - Scale: White coated aluminum, with permanently etched markings.
 - Range:
 - Pump Suctions: 30-inch Hg - 60 PSI.
 - Water: 0 - 125 PSI.
- Differential Pressure Switches
 - Sensing Range: 0- to 1.0-inch water column. Diaphragm operated with switching accomplished by photocell controlled relays, adjustable switch setpoints that close contacts on the relay if the differential pressure sensed raised above the setpoint, incorporate a pointer type gauge with divisions of 0.02-inch W.C.

- Instrument probe fittings
 - Brass or stainless steel body and cap, high pressure rated, valve material neoprene, Nordan or Viton to suit temperature range, 1/4 inch or 1/2-inch NPT tailpiece
- Expansion joints
 - Furnish and install controlled flexing expansion joints where shown or required including building and seismic separations. Expansion Joints: Minimum of 150 PSI working pressure.
 - For copper piping, 3/4 inch through 3 inches, use Type HB, 1-3/4-inch traverse two-ply stainless steel bellows, traveling nipple extended through bellows and guided each end, integral shroud, screwed steel ends.
 - For steel piping, 1-1/2 inches through 8 inches externally pressurized. 4-inch traverse, 150 PSI working pressure, stainless steel bellows, 150 PSI flanged ends, furnish insulation shroud
- Pipe guides
 - Install where using expansion joints to avoid pipe buckling
- Pipe anchors
 - Install where using expansion joints to avoid pipe displacement
- Valve trains
 - The sequence of heating and cooling valve train componentry shall be as follows:
 - Ball type isolation valve
 - control valve
 - Pete's plug
 - Union
 - VAV box
 - Union
 - Pete's plug
 - Drain valve (hose bib) or Y-strainer (only if recommended by valve manufacturer)
 - Circuit setter on pressure dependent valves only
 - Ball type isolation valve

Approved Manufacturers:

- Manual air vent valves
 - Armstrong
 - Bell & Gossett
 - Hoffman
 - Spirax
 - Sarco
- Automatic air vent valves
 - Taco
 - Bell & Gossett
 - Hoffman
- Automatic flow control valves
 - Griswold
 - Taco
 - Bell & Gossett
- Strainers
 - Mueller
 - Armstrong
 - Hoffman
 - Wheatley
 - Victaulic (where mechanical couplings are allowed)
- Air separators
 - Amtrol
 - Armstrong
 - Bell & Gossett
 - Taco
 - Wheatley
- Expansion tanks
 - Mueller
 - Amtrol

- Armstrong
 - Taco
 - Bell & Gossett
- Liquid flow switches
 - McDonnell & Miller
 - Dwyer
- Water pressure relief valves
 - Amtrol
 - Bell & Gossett
 - Spirax Sarco
 - Watts Regulator
- Water pressure reducing valves
 - Amtrol
 - Armstrong Pumps
 - Bell & Gossett
 - Taco
- Thermometers & Thermometer wells
 - Ashcroft
 - Trerice
 - Weiss
- Pressure gages
 - Amtek/U.S. Gauge
 - Ashcroft, Palmer
 - Marshaltown Instruments
 - Trerice
 - Weiss
 - Weksler
- Expansion joints
 - Flexonics
 - Mason Industries
 - Amber-Bush

- Metraflex
- Pipe guides
 - Flexonics
 - Mason Industries
 - Amber-Bush
 - Metraflex
- Pipe anchors
 - Flexonics
 - Mason Industries
 - Amber-Bush
 - Metraflex
- Pot Feeders
 - Nu-Calgon Micromet

Substitutes Allowed:

Yes, if performance and quality equivalency can be evidenced.

Associated Design Standards and Construction Specifications

- Division 23 HVAC Design Standards
- 23 05 10 – Hydronic Piping Design Standard
- 23 05 29 - Hangers And Supports for HVAC Piping and Equipment Design Standard
- 23 05 53 - Identification for HVAC Piping and Equipment Design Standard

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