

## 23 21 13 Hydronic Piping HVAC Service Piping

### .01 General Requirements

#### A. Hydronic Piping Design:

1. General: Follow the Hydronic System Pipe Sizing guidelines in current edition of ASHRAE Fundamentals Handbook.
2. Design to keep system pressure drop low to minimize pump energy and long-term operating costs.
  - a. Use pipe fittings with low pressure drop characteristics such as long radius elbows, 45° laterals and Tee Wyes in main branches, tapered concentric/eccentric reducers, and bell-mouth inlets.
  - b. Do not use fittings with abrupt changes that cause high pressure drops such as non-tapered reducing flanges or couplings, or bullhead tee connections (either two streams connected to each end of a tee with the discharge on the branch, or the main flow coming into the branch connection and discharging at each end).
3. Pipe sizes shall be indicated on the plans at each change in direction and at all branch take off locations.
4. Minimum distribution pipe size shall be ¾", except ½" runout piping may be used after shut-off valves to individual terminals.
5. Piping systems shall be designed and installed with adequate pitch to permit all sections of the system to be properly and fully drained. All supply water piping shall be graded up and return graded down in the direction of flow. Provide sediment leg and hose end ball drain valves at all low points of systems, at bases of riser, and at lowest points at equipment runouts, typically on downstream side of shut-off valves.
6. Avoid running piping in such a way that will create air traps at local high points or tend to accumulate dirt legs at low local low points. If otherwise unavoidable, provide automatic air vents at high points and blow down drain valves on dirt legs at low points.
7. Differential pressure control of system pumps shall never be accomplished at the pump. The pressure bypass shall be provided near the end of the system.
8. All piping run within the building shall be run concealed in the finished portions of building in pipe spaces, ceilings or furred chases and exposed only in mechanical rooms and where shown on the drawings.
9. No pipe shall pass in front of or interfere with any openings, door or window. Head room in front of openings and doors shall in no case be less than the top of the opening.
10. Piping shall not pass exposed through electrical rooms or be erected over any switchboard or other electrical gear.
11. Provide 2-inch clearance between insulated piping and other obstructions.

#### B. Unions:

1. No union shall be placed in a location which will be inaccessible.
2. Unions shall be installed adjacent to all equipment for repair and replacement.

#### C. Electrolysis Control:

1. Electrolysis control between dissimilar materials shall be achieved through the use of dielectric nipples and a non-dielectric union.
2. Dielectric unions are prohibited.

D. Sleeves:

1. All pipes passing through wall or floor construction shall be fitted with sleeves. Each sleeve shall extend through its respective floor, wall or partition and shall be cut flush with each surface unless otherwise specified. Sleeves shall be two pipe sizes larger than the pipe when un-insulated and of sufficient size to allow for the insulation without binding. Floor sleeves in mechanical rooms shall extend 4 inches above finished floor, all other spaces minimum one inch above finished floor.
2. Sleeves in bearing walls, masonry walls, masonry partitions, and floors shall be standard weight steel pipe finished with smooth edges. For other than masonry partitions, through suspended ceilings and for concealed vertical piping, sleeves shall be No. 22 USG galvanized steel.
3. Where pipes pass through waterproofed floor or walls, design of sleeves shall be such that waterproofing can be flashed into and around the sleeves.
4. Sleeves through exterior walls below grade shall have the space between pipes and sleeves caulked watertight.
5. Install one-piece chrome-plated escutcheon plates with set screw at sleeves for all pipes exposed in finished areas.
6. The annular space between sleeves and pipe shall be filled with fiberglass insulation and caulked in non-fire rated situations.
7. Where pipes pass through fire-rated floors, walls, or partitions, the use of a UL approved system for through penetrations is required. The annular space around the pipes shall be packed with mineral wool or other noncombustible material and sealed at each exposed edge to maintain the rating of the system in accordance with the through penetration sealant manufacturer's recommendations.

E. System and Equipment Drains:

1. Where sectionalizing valves are installed, a drain shall be installed on downstream side of valve to drain that section of the system.
2. All cooling tower drains and overflow are to be piped to sanitary system (not onto roof).
3. All system and equipment drains are to be piped to a floor drain.

F. Welding:

1. All welding shall be done in accordance with the AWS.
2. All boiler, pressure vessel, and hydronic piping welding must be done by certified welders must be done by certified welders as required by applicable codes.
3. All welding must be done with portable welding machines.

G. Pressure Tests:

1. Tests shall be in accordance with Guide Specification.
2. All piping must be tested prior to receiving insulation.
3. Pressure tests must be witnessed and acknowledged in writing by a University representative.

4. Without exception, no air pressure testing shall be permitted for chilled water, hot water, steam, steam condensate, domestic water, sanitary, wet sprinkler, or plastic pipe installations.
5. For specialized cases where air testing is required, such as dry sprinkler pipe, fuel lines, refrigerant piping, or medical gas, approval shall be required from the Penn State Project Manager. In these cases appropriate safety measures will be coordinated with the OPP safety office on a case-by-case basis.
- 3.6. Installers shall follow the applicable section of the OPP Piping Pressure Tests Requirements.

H. Piping System Cleaning:

1. All hydronic systems shall be chemically cleaned after all items of equipment have been connected to the system and all piping has been complete. Cleaning shall be done prior to installing chemical treatment of glycol, and prior to acceptance by the University. See 23 25 00 for more information.
2. Notify the University at least one week in advance of the date and time that system cleaning is to take place. The University shall observe the system cleaning process.