1 Pipe Penetrations

1.1 All pipe penetrations through interior walls will be sealed to prevent air transfer.

Note: Interior wall holes that are oversized can make pressure control difficult.

2 Pressure sensing locations

2.1 Each main line strainer and each heat exchanger needs a pressure sensing point with gage cock at the inlet and outlet.

2.2 To the extent possible all pressure sensing locations should be piped to a common pressure gauge.

Note: Using a single pressure gauge provides an accurate differential pressure measurement even when the gauge has lost calibration.

Exception: Small items (fan coil units VAV box reheat coils, etc.) may have PT plugs instead of gauges.

3 Thermometers

3.1 Each device using chilled or heating water should have thermometers at the inlet and outlet.

Note: Reading the heat exchanger differential pressure and temperature is critical for field verification of exchanger operation.

Exception: Small items (FCUs, VAV box reheat coils, etc.) may have PT plugs instead of a thermometer.

4 Balancing valves at the pump discharge

4.1 System designed to be constant volume should have a VFD controlling the speed to eliminate the need for balancing or triple duty valves.

Note: Using balancing valves to restrict flow uses more energy than using a VFD to reduce the pump speed.

5 Manual Balancing Valves

5.1 When using manual valves to balance a hydronic circuit they must be fully repeatable position, globe valves with multi-turn handle with position indicator as opposed to simple “circuit setter” balancing valves.

5.2 When building operation and maintenance personnel do not have the appropriate instrumentation, consideration should be given to have the valve manufacturer supply an instrumentation kit for reading the pressure differential across the valve and valve position, and converting to flow rate.

6 Isolation Valves

6.1 Install isolation valves at main piping distribution that isolate building sections, at all branch lines off main pipes, at all pieces of equipment, and at specialty items.

7 Piping

7.1 Pipes can be Type L copper or schedule 40 black steel.

Note: Be aware of electrolysis. Steel acts as an anode, giving up ions to the copper, the cathode. Thus, a system with a small amount of steel to a large quantity of copper will have premature failure of the steel pipe.

7.2 Water velocity shall not exceed 10 FPS.

Note: Velocities of 10 FPS will erode the pipe.

7.3 Pipe size should not be less than ¾”.

7.4 The first fitting inside a building must be a welded fitting.

Note: When the system is subjected to a pressure spike (as occasionally happens) this first fitting inside the basement takes the brunt of the pressure spike and has been known to catastrophically fail.

7.5 Other than the first fitting, grooved mechanical couplings may be used inside a building on steel pipe where installed applications meet manufacturer’s published recommended applications (ASME B31.3).

7.5.1 Grooved mechanical couplings must be installed according to the manufacturer’s published, installation procedure, up to and including meeting coupling bolt torque requirements. When torque requirements are necessary, the installing contractor must provide written documentation detailing that this requirement has been met at each installed coupling.

7.6 Copper and copper alloy press-connect pressure fittings on copper pipe may be used inside a building where installed applications meet
manufacturer’s published recommended applications (ASME B16.51).

7.7 In cross-section at hydronic main, all branch lines shall take-off at or above the horizontal centerline of the main.

7.8 Comply with ASHRAE 90.1-2013 Table 6.5.4.6 Piping System Design Maximum Flow Rate in GPM when sizing hydronic piping systems as modified and listed in table below:

<table>
<thead>
<tr>
<th>Operating Hours/Year</th>
<th>≤ 4,400 Hours/Year</th>
<th>&gt; 4,400 Hours/Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal Pipe Size, in.</td>
<td>Other Variable Flow/Variable Speed</td>
<td>Other Variable Flow/Variable Speed</td>
</tr>
<tr>
<td>2 1/2</td>
<td>85</td>
<td>68</td>
</tr>
<tr>
<td>3</td>
<td>140</td>
<td>110</td>
</tr>
<tr>
<td>4</td>
<td>260</td>
<td>210</td>
</tr>
<tr>
<td>5</td>
<td>610</td>
<td>250</td>
</tr>
<tr>
<td>6</td>
<td>570</td>
<td>440</td>
</tr>
<tr>
<td>8</td>
<td>900</td>
<td>700</td>
</tr>
<tr>
<td>10</td>
<td>1300</td>
<td>1000</td>
</tr>
<tr>
<td>12</td>
<td>1900</td>
<td>1500</td>
</tr>
<tr>
<td>*14-24</td>
<td>6.5 ft./s</td>
<td>5.0 ft./s</td>
</tr>
</tbody>
</table>

*Maximum velocity for pipes over 14-24" NPS.

8 Utility meters

8.1 When new buildings are being designed multiple utilities supplied to the facility are to be individually metered including chilled water.

9 West Lafayette Chilled Water Design Data

9.1 Supply Temperature

9.1.1 Summer: 45°F is supplied to the building wall with good reliability (the system is above 48°F less than 2% of the time).

Note: The designer must take into account temperature rise inside the building.

9.1.2 Winter: 47°F is the winter basis of design

Note: The winter supply temperature is more likely to drift

9.2 The design return temperature is 63°F LWT from the coil

9.3 Differential Pressure

- 10 psig summer
- 15 psig winter

10 Chilled Water Pipe Coating

10.1 Corrosion resistant paint should be applied to all steel chilled water pipe prior to being covered with insulation.

11 Strainer screens size table

<table>
<thead>
<tr>
<th>Use</th>
<th>Pipe Size</th>
<th>Screen Size</th>
<th>Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2&quot; and smaller</td>
<td>0.033 perforations (1/32&quot; or 20 mesh)</td>
<td>250 PSI</td>
</tr>
<tr>
<td></td>
<td>2 1/2&quot; and larger</td>
<td>0.045 perforations (3/64&quot; or 16 mesh)</td>
<td>125 PSI</td>
</tr>
<tr>
<td></td>
<td>2&quot; and smaller</td>
<td>0.062 perforations (1/16&quot; or 10 mesh)</td>
<td>250 PSI</td>
</tr>
<tr>
<td></td>
<td>2 1/2&quot; to 4&quot;</td>
<td>0.062 perforations (1/16&quot; or 10 mesh)</td>
<td>125 PSI</td>
</tr>
<tr>
<td></td>
<td>5&quot; and larger</td>
<td>0.125 perforations (1/8&quot; or 7 mesh)</td>
<td>125 PSI</td>
</tr>
</tbody>
</table>

Note: Frequently contractors purchase one screen size for an entire project, or a strainer with a screen sized for steam is used for a hydronic system. When done the strainer clogs quickly. When followed this table avoids this problem.

12 Closed Loop Air and Sediment Control

12.1 Closed loop hydronic systems shall be installed with combination air eliminator/dirt separator with flanged, removable head for bundle removal for the purposes of cleaning and inspection; isolation valves and normally-closed bypass for uninterruptable replacement; and integral drain valve for manual system flushing.