230500  HVAC BASIC MATERIAL AND METHODS

PART 1  GENERAL

1.01 RELATED CORNELL DESIGN AND CONSTRUCTION STANDARDS

A. Section 230000 – Basic HVAC Requirements
B. Section 230523 – Valves
C. Section 230510 – Chilled Water Systems
D. Section 230520 – Heat Generation
E. Section 232300 – Refrigeration
F. Section 238216 – Coils

1.02 SCOPE

A. This section applies to HVAC materials installed within the perimeter of the structure from the meter or utility connection to points of utilization with the building. For service piping outside the building perimeter, please contact Cornell Utilities.

PART 2  PRODUCTS

2.01 GENERAL

A. Use of grooved joint fittings are strictly prohibited on campus chilled water systems.

B. Use Teflon tape for threaded pipe; use joint compound on high pressure steam.

C. The only type of copper pressure seal fitting system that is allowed to be used on campus are those that use a mechanical joint that crimps on both sides of the O-ring, and shall be limited to use on hydronic heating and process chilled water systems. The only acceptable manufacturer is Viega.

D. Piping shall be fully labeled throughout (mechanical rooms, chases and throughout buildings). Labels should include name of system, flow arrow, color code and size of pipe. Stencils are acceptable. Label every 25 feet, and at all penetrations and branches.

E. Provide vents and drains (minimum 1/2") with brass hose connector and cap at all high and low points in piping systems.
F. On chilled water systems, use a Schedule 80 galvanized steel nipple between the steel piping and the first isolation valve on all connections to steel pipe below 3-inches.

G. Processed chilled water systems are defined as being an independent cooling loop separated from the campus chilled water distribution system by a plate and frame heat exchanger that is intended to serve as a heat rejection sink for water cooled equipment, such as walk-in coolers, lasers, etc. A chilled beam cooling loop is not considered a process chilled water system.

H. Due to Cornell’s experience with increased frequency of maintenance, the following piping specialties are not allowed on campus:

1. Dielectric Unions
2. Automatic Flow Control Valves
3. Combination balancing and shutoff valve
4. Triple Duty Valves

I. Please consult with Facilities Engineering for deviations from these standards.

2.02 HOSES AND HOSE BIBBS

A. All hose bibbs and other fittings with hose connections shall be provided with vacuum breakers.

B. Hose bibbs on building exteriors shall be frost-free type.

2.03 GATE VALVES

A. Gate valves are generally not acceptable. Use ball and butterfly valves only. See Cornell Design and Construction Standard 230523.

2.04 PRESSURE GAUGES

A. On devices such as pumps, strainers, coils, etc., where the differential pressure is the desired information, install only one pressure gauge with valved connections to the upstream and downstream pressure taps. Include a P/T test port in addition to the pressure gauge. Provide a second set of isolating valves at the gauge if gauge location is not within reach of tap points.

B. Pressure gauges shall be stainless steel case, non-repairable, silicone filled with minimum 3 1/2” diameter case. Gauges shall have 3% accuracy over the appropriate range of 0-30 psi, 0-100, or 0-160; and shall include a shut-off ball valve (gauge cocks are not permitted). Include a pigtail cooling loop on all steam gauges. Scale should be selected to provide a reading at mid-scale during normal operation. No snubbers.
2.05 THERMOMETERS

A. Thermowells: All thermowells for steam service shall be stainless steel and for water service shall be brass. Thermowell length shall be in accordance with ISA standards and shall include the appropriate extension to allow for pipe installation. Extension neck shall be included when required to match thermowell and insulation thickness.

B. Thermometers: Provide one of the following:

1. Industrial stick type, mercury free, 9" case, with locking adjustable angle body and a case of aluminum or non-metallic material. Thermometer shall be secured to well by tapered bushing and not by set screws. Provide the following characteristics:
   a. Scale Graduations: 2 °F.
   b. Range: Select to provide a mid-scale reading at normal operating temperature.
   c. Accuracy: 1%.

2. Industrial light-powered digital thermometer with adjustable-angle stem and a case of aluminum or high impact ABS plastic. Thermometer shall be secured to thermowell by tapered bushing and not by set screws. Installation shall insure that thermometer is accessible and has been adjusted to be readable from a 5-foot level as viewed from the floor. Display shall be LCD with digits a minimum of 0.5-inch high with the following characteristics:
   a. Resolution: 0.1 °F.
   b. Range: -40 to 300 °F.
   d. Accuracy: 1%.

3. Acceptable Manufacturer’s:
   a. Trerice
   b. Weiss Instruments
   c. Weksler

2.06 PUMPS

A. All pumps shall have mechanical seals with carbon and ceramic seats.

B. All pump bases shall be grouted.

C. All vibration isolators shall be installed parallel to the pump shaft.

D. Install pressure gauge manifold to gauge tappings in pump body.
E. The Engineer can consider the use of vertically mounted in-line pumps for all
hydronic system applications as they save space and are, in general, easier to maintain
than other centrifugal pump designs.

2.07 PIPING ACCESSORIES

A. Pressure/temperature test ports shall be provided on each coil bank, heat exchanger,
fan coil, and at all permanent pressure gauge locations. Use extended body style to
allow for insulation thickness. Seals shall be appropriate for operating water
temperature and pressure as follows:

1. Hot Water, Glycol - Nordel Seat
2. Cold Water, Chilled Water - Neoprene Seat

B. All coils and heat exchangers shall be equipped to measure and adjust flow.
Adjustable valves with flow measuring taps are preferred. The balancing valve shall
not be used for coil isolation—provide ball or butterfly isolation valves in addition to
the balancing valves.

C. If a balancing valve with flow taps cannot be used (larger than 12”), use a non-
lubricated eccentric plug valve (such as Dezurik) combined with a flowmetering run
and an Annubar flowmeter.

2.08 METERS


C. Provide a water meter on large permanent hard piped make-up lines to water systems
(radiation, closed loop cooling, or systems with underground piping) to track make-
up to these systems.

2.09 PIPE, FITTINGS AND JOINING MATERIALS

A. Chilled Water

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Pipe</th>
<th>Fittings</th>
<th>Joint</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5-inch &amp; below</td>
<td>ASTM B88 Type L Hard Copper</td>
<td>ASME B16.22 Wrought Copper</td>
<td>ASTM B32 Solder 95 Sn / 5 Sb 95.5 Sn / 4 Cu / 0.5 Ag</td>
</tr>
<tr>
<td>3-inch &amp; above</td>
<td>ASTM A53 Sch 40 Black Steel</td>
<td>ASME B16.9 Wrought Steel</td>
<td>ASME B16.9 Butt weld</td>
</tr>
</tbody>
</table>
### B. Process Chilled Water

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Pipe</th>
<th>Fittings</th>
<th>Joint</th>
</tr>
</thead>
<tbody>
<tr>
<td>All sizes</td>
<td>ASTM B88</td>
<td>ASME B16.22</td>
<td>ASTM B32 Solder</td>
</tr>
<tr>
<td></td>
<td>Type L Hard Copper</td>
<td>Wrought Copper</td>
<td>95 Sn / 5 Sb</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>95.5 Sn / 4 Cu / 0.5 Ag</td>
</tr>
<tr>
<td>2-inch &amp; below</td>
<td>ASTM B88</td>
<td>ASME B16.22</td>
<td>ASME B16.22 Copper Pressure Seal</td>
</tr>
<tr>
<td></td>
<td>Type L Hard Copper</td>
<td>Wrought Copper</td>
<td>EPDM Sealing Element</td>
</tr>
</tbody>
</table>

### C. Heating Hot Water

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Pipe</th>
<th>Fittings</th>
<th>Joint</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5-inch &amp; below</td>
<td>ASTM B88</td>
<td>ASME B16.22</td>
<td>ASTM B32 Solder</td>
</tr>
<tr>
<td></td>
<td>Type L Hard Copper</td>
<td>Wrought Copper</td>
<td>95 Sn / 5 Sb</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>95.5 Sn / 4 Cu / 0.5 Ag</td>
</tr>
<tr>
<td>3-inch &amp; above</td>
<td>ASTM A53</td>
<td>ASME B16.9</td>
<td>ASME B16.9 Butt weld</td>
</tr>
<tr>
<td></td>
<td>Sch 40 Black Steel</td>
<td>Wrought Steel</td>
<td></td>
</tr>
<tr>
<td>2-inch &amp; below</td>
<td>ASTM B88</td>
<td>ASME B16.22</td>
<td>ASME B16.22 Copper Pressure Seal</td>
</tr>
<tr>
<td></td>
<td>Type L Hard Copper</td>
<td>Wrought Copper</td>
<td>EPDM Sealing Element</td>
</tr>
</tbody>
</table>

### D. Low Pressure Steam, 15 psig and below

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Pipe</th>
<th>Fittings</th>
<th>Joint</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-inch &amp; below</td>
<td>ASTM A53</td>
<td>ASME A126</td>
<td>ASME B16.4 Threaded</td>
</tr>
<tr>
<td></td>
<td>Sch 40 Black Steel</td>
<td>ASME B16.4</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cast Iron</td>
<td></td>
</tr>
<tr>
<td>2.5-inch &amp; above</td>
<td>ASTM A53</td>
<td>ASME B16.9</td>
<td>ASME B16.9 Butt weld</td>
</tr>
<tr>
<td></td>
<td>Sch 40 Black Steel</td>
<td>Wrought Steel</td>
<td></td>
</tr>
</tbody>
</table>
E. High Pressure Steam, Above 15 psig

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Pipe</th>
<th>Fittings</th>
<th>Joint</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-inch &amp; below</td>
<td>ASTM A53 Sch 40 Black Steel</td>
<td>ASME B16.9 Wrought Steel</td>
<td>ASME B16.9 Butt weld</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ASME B16.11 Forged Steel</td>
<td>ASME B16.11 Socket Weld</td>
</tr>
<tr>
<td>2.5-inch &amp; above</td>
<td>ASTM A53 Sch 40 Black Steel</td>
<td>ASME B16.9 Wrought Steel</td>
<td>ASME B16.9 Butt weld</td>
</tr>
</tbody>
</table>

F. Steam Condensate

<table>
<thead>
<tr>
<th>Sizes</th>
<th>Pipe</th>
<th>Fittings</th>
<th>Joint</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-inch &amp; below</td>
<td>ASTM A53 Sch 80 Black Steel</td>
<td>ASTM A126 ASME B16.4 Cast Iron</td>
<td>ASME B16.4 Threaded</td>
</tr>
<tr>
<td>2.5-inch &amp; above</td>
<td>ASTM A53 Sch 80 Black Steel</td>
<td>ASME B16.9 Wrought Steel</td>
<td>ASME B16.9 Butt weld</td>
</tr>
</tbody>
</table>