SECTION 15105CP - PIPES AND TUBES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes pipe and pipe fittings for: heating water, chilled water, steam and steam condensate, condenser water, glycol, refrigerant and engine exhaust.

B. Related Sections:
1. Section 09900 - Paints and Coatings: Product requirements Painting for placement by this section.
2. Section 15070 – Mechanical Sound, Vibration, and Seismic Control: Product requirements for Vibration Isolation for placement by this section.
3. Section 15080 - Mechanical Insulation: Product requirements for Piping Insulation for placement by this section.
4. Section 15060.C – Hangers and Supports Criteria Based Requirements.

1.2 SYSTEM DESCRIPTION

A. Where more than one piping system material is specified, provide compatible system components and joints. Provide flanges, union, and couplings at locations requiring servicing.

B. Use unions, flanges, and couplings downstream of valves and at equipment or apparatus connections. Use non-conducting dielectric connections whenever jointing dissimilar metals in open systems. Do not use direct welded or threaded connections to valves, equipment or other apparatus.

C. Provide pipe hangers and supports unless indicated otherwise.

D. Flexible Connectors: Utilize at or near compressors where piping configuration does not absorb vibration.

E. Grooved end piping may be used on condenser water and fire sprinkler systems only; it may not be utilized on heating, dual temperature (seasonal hot and cold water) and chilled water systems. Piping system (couplings and fittings) manufacturer is limited to Victaulic.

PART 2 - PRODUCTS

2.1 HIGH TEMPERATURE HOT WATER PIPING, ABOVE GROUND

A. Steel Pipe:
1. Materials: ASTM A53 or A106, Grade B, seamless.

2. Wall thickness:
   a. Up to and including 2 inch diameter: Schedule 80, socket weld ends.
   b. Above 2 inch: Schedule 40, butt-weld ends.

3. Fittings: Socket-weld up to and including 2 inch, butt-weld above 2 inch.

2.2 HEATING WATER AND GLYCOL PIPING, ABOVE GROUND

A. Steel Pipe: Schedule 40, black.
   1. Fittings: Malleable iron or forged steel, minimum 150 pound service rating.
   2. Joints: Screwed through 2", or welded in any size.

B. Copper Tubing: Type L hard drawn.
   1. Fittings: Cast brass, or ASME B16.22 solder wrought copper.
   2. Joints: Solder shall be lead-free tin and silver with melting range 430 to 535 degrees F, or silver solder minimum 5%.

2.3 CHILLED WATER PIPING, ABOVE GRADE

A. Steel Pipe: Schedule 40, black.
   1. Fittings: Malleable iron or forged steel, minimum 150 pound service rating.
   2. Joints: Screwed through 2", or welded in any size.

B. Copper Tubing: Type L hard drawn.
   1. Fittings: Cast brass, or ASME B16.22 solder wrought copper.
   2. Joints: Solder shall be lead-free tin and silver with melting range 430 to 535 degrees F, or silver solder minimum 5%.

2.4 CONDENSER WATER PIPING, ABOVE GROUND

A. Steel Pipe: Schedule 40 sizes **3** inch and over, black.
   1. Fittings: Fittings: Malleable iron or forged steel minimum 150 pound service rating; grooved piping permissible if piping not required to be insulated.
   2. Joints: Welded.

B. Copper Tubing: Type L hard drawn.
   1. Fittings: Cast brass, or ASME B16.22 solder wrought copper.
   2. Joints: Solder shall be lead-free tin and silver, with melting range 430 to 535 degrees F, or silver solder minimum 5%.

2.5 RADIANT HEATING PIPING

A. Copper Tubing: Type L hard drawn.
   1. Fittings: Cast brass, or ASME B16.22 solder wrought copper.

2. Joints: Solder shall be lead-free tin and silver with melting range 430 to 535 degrees F, or silver solder minimum 5%.

B. Tubing: Composite hose with nitrile liner, braided fiber reinforcing, neoprene cover, 150 psig operating pressure at 205 degrees F, or PEX.
1. Fittings: Copper or PEX.
2. Joints: Nipple with stainless steel clamp.

2.6 EQUIPMENT DRAINS AND OVERFLOWS

A. Steel Pipe: Schedule 40 galvanized.
1. Fittings: Galvanized cast iron, or malleable iron.
2. Joints: Threaded, or grooved mechanical couplings.

B. Copper Tubing: Type L hard drawn.
1. Fittings: Cast brass, or ASME B16.22 solder wrought copper.
2. Joints: Solder shall be lead-free tin and silver with melting range 430 to 535 degrees F, or silver solder minimum 5%.

2.7 ENGINE EXHAUST

A. Steel Pipe: Schedule 40, black.
1. Fittings: Malleable iron or forged steel welding type.
2. Joints: Threaded for pipe 2 inch and under; welded for pipe over 2 inch.

2.8 HIGH PRESSURE STEAM AND CONDENSATE PIPING 1,500 PSIG MAXIMUM

A. For 900 # steam in Central Heat Plant, use 1,500-pound service rating as approved by Central Heat Plant Chief Engineer and Engineering Office, and approved in writing by Brown Project Manager.

2.9 MEDIUM AND HIGH PRESSURE STEAM PIPING 150 PSIG MAXIMUM

A. Steel Pipe: Schedule 80, black.
1. Fittings: Malleable iron Class 250,or forged steel welding type, Class 300.
2. Joints: Threaded or welded.

2.10 LOW PRESSURE STEAM PIPING 15 PSIG MAXIMUM

A. Steel Pipe: Schedule 40, black.
1. Fittings: Malleable iron or forged steel, minimum 150 pound service rating.
2. Joints: Threaded or welded.

2.11 MEDIUM AND HIGH PRESSURE STEAM UP TO 150 PSIG MAXIMUM CONDENSATE PIPING

A. Steel Pipe: Schedule 80, black.
1. Fittings: Malleable iron Class 250,or forged steel welding type, Class 300.

2. Joints: Threaded or welded.

2.12 LOW PRESSURE STEAM CONDENSATE PIPING

A. Steel Pipe: Schedule 80, black.
1. Fittings: Malleable iron Class 125 or forged steel Class 125.
2. Joints: Threaded, or welded.

B. Copper Tubing: Type K hard drawn.
1. Fittings: Cast brass or wrought copper.
2. Joints: Solder shall be lead-free tin and silver with melting range 430 to 535 degrees F, or silver solder minimum 5%.

2.13 REFRIGERANT PIPING

A. Copper Tubing: Type ACR hard drawn.
1. Fittings: Wrought copper.
2. Joints: Solder shall be lead-free tin and silver with melting range 430 to 535 degrees F, or silver solder minimum 5%.

B. Copper Tubing to 7/8 inch OD: Type K, annealed.
1. Fittings: Cast copper.
2. Joints: Flared or soldered. Solder shall be lead-free tin and silver with melting range 430 to 535 degrees F, or silver solder minimum 5%.

C. Steel Pipe: Schedule 40, black.
1. Fittings: Forged steel welding type, Class 300.
2. Joints: Welded.

2.14 UNIONS, FLANGES, AND COUPLINGS

A. Unions for Pipe 2 inches and Under:
1. Ferrous Piping: malleable iron, threaded, 300 PSIG service rating.
2. Copper Pipe: Bronze, soldered joints. Solder shall be lead-free tin and silver with melting range 430 to 535 degrees F, or silver solder minimum 5%.

B. Flanges for Pipe Over 2 inches:
1. Ferrous Piping: 150 psig service: forged steel, slip-on. 300 psig service: 300 psig rated.
2. Copper Piping: Bronze. If soldered, solder shall be lead-free tin and silver, with melting range 430 to 535 degrees F, or silver solder minimum 5%.
3. Gaskets: 1/16 inch thick preformed neoprene for service under 250 degrees F. Above 250 degrees F, use spiral wound 304 stainless steel similar to “Flexitaulic”

C. Grooved and Shouldered Pipe End Couplings where permitted:
   1. Housing Clamps: Malleable iron to engage and lock designed to permit some angular deflection, contraction, and expansion.
   2. Sealing Gasket: C-shape elastomer composition for operating temperature range from -30 degrees F 230 degrees F.
   3. Accessories: Steel bolts, nuts, and washers.

D. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, and water impervious isolation barrier. Solder shall be lead-free tin and silver with melting range 430 to 535 degrees F, or silver solder minimum 5%.

2.15 FLEXIBLE CONNECTORS

A. Corrugated stainless steel or bronze hose with single layer of stainless steel exterior braiding, minimum 9 inches long with copper tube ends; for maximum working pressure as required by specific project. If soldered, solder shall be lead-free tin and silver, with melting range 430 to 535 degrees F, or silver solder minimum 5%.

PART 3 – EXECUTION

3.1 Installation

A. Route piping parallel to building structure and maintain gradient.

B. Install piping to conserve building space, and not interfere with use of space.

C. Group piping whenever practical at common elevations.

D. Provide access where valves and fittings are not exposed. [Coordinate size and location of access doors with Section 08310.]

E. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.
   1. Slope steam piping one inch in 40 feet in direction of flow. Use eccentric reducers to maintain bottom of pipe level.
   2. Slope steam condensate piping one inch in 20 feet. Provide drip trap assembly at low points and before control valves. Run condensate lines from trap to nearest condensate receiver. Provide loop vents over trapped sections.

F. Arrange refrigeration piping to return oil to compressor. Provide traps and loops in piping, and where necessary provide double risers. Slope horizontal piping 0.40 percent in direction of flow.

G. Install flexible couplings only where required for vibration isolation; orient with respect to rotating equipment and install per manufacturer's direction. Misaligned piping shall not be permitted to be connected with vibration isolators.

3.2 Cleaning

A. After flushing, clean systems by circulating and draining water a minimum of 2 times. Where work is an expansion or modification to an existing piping system, cleaning or flushing is to include the existing system or portions of the existing system up to the nearest isolation valves.

B. For high temperature hot water systems, add alkaline boil-out chemical (CT-23 by ChemTreat or equal).

C. Coordinate with project manager for required permits to dispose of flush water.

3.3 Testing

A. Hydro-test piping systems operating at less than 100 PSIG, at 150 PSIG. System operating above 100 PSIG, test at 150% of operating pressure.

B. Radiograph 25% of random field welds for medium temperature hot water, chilled water, condenser water, condensate and steam piping.

C. Radiograph 100% of all welds for high temperature hot water piping.

D. Radiograph 100% of all welds for underground piping for chilled water and medium temperature hot water systems.

END OF SECTION