# GENERAL

## SECTION INCLUDES

## [Note to A/E: Edit following section to include/exclude actual project hydronic systems]

### Above grade pipe, fittings, and joints for:

#### Heating water piping systems.

#### Chilled water piping systems.

#### Heat pump water piping systems.

#### Heat recovery water piping systems.

#### Equipment drains and overflows.

#### Process cooling water systems.

### Valves.

## REFERENCE SECTION 23 05 00 FOR THE FOLLOWING:

### Quality assurance.

### References.

### Submittals.

#### Provide welding certifications for all welders on the project.

### Operation and maintenance manuals.

### Project record documents.

#### Record actual locations of valves.

### Delivery, storage, and handling.

## SYSTEM DESCRIPTION

### Where more than one piping system material is specified, ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

### Use unions, flanges, and couplings downstream of valves and at equipment or apparatus connections. Do not use direct welded or threaded connections to valves, equipment or other apparatus.

### Where connecting ferrous and non-ferrous piping materials, use full-port ball valves with bronze construction or a galvanized steel dielectric nipples with plastic liner to separate piping materials.

### Use gate, ball or butterfly valves for shut‑off and to isolate equipment, part of systems, or vertical risers or as shown on plans.

### Use ball or butterfly valves for throttling, bypass, or manual flow control services or as shown on plans.

### Use lug end butterfly valves to isolate equipment.

## REGULATORY REQUIREMENTS

### Conform to International Mechanical Code for installation of piping system.

### Welding Materials and Procedures: Conform to ASME SEC 9 and applicable state and local labor regulations.

### Welders shall be certified using AWS testing methods. .

## ENVIRONMENTAL REQUIREMENTS

### Do not install underground piping when bedding is wet or frozen.

## EXTRA MATERIALS

### Provide two repacking kits for each size and valve type.

# PRODUCTS

## STEEL PIPING, FITTINGS, AND JOINTS

### Applicable Systems

#### Heating water

#### Chilled water

#### Heat recovery water

#### Condenser water

#### Heat pump water

### Pipe: ASTM A53, Schedule 40, black steel.

### Fittings (2” and smaller): Malleable Iron: ASTM B16.3, Class 150, threaded or Cast Iron: ASTM B16.4, Class 125, threaded.

### Fittings (2-1/2” and larger):

#### ASTM B16.9, steel butt weld fittings. Bushings are not permitted, use standard reducing fittings.

### Joints (2” and smaller): Threaded. Joint compound must be rated for propylene glycol usage.

### Joints (2-1/2” and larger):

#### AWS D1.1, welded.

### Branch Tees: Weld-O-Lets and Thread-O-Lets are acceptable for branch piping when main piping is 1" or larger than branch piping.

### Saddle Tees: Are acceptable for branch piping when main piping is 2" or larger than branch piping.

### Unions (2” and smaller): 150 psig malleable iron, threaded.

### Flanges (2-1/2” and larger): 150 psig forged steel, slip‑on, 1/16 inch thick preformed neoprene gaskets.

### Steel (ferrous) piping, fittings and equipment shall not be used in process cooling water systems.

## Copper TubinG, FITTINGS, AND JOINTS

### Applicable Systems

#### Heating water

#### Chilled water

#### Heat recovery water

#### Condenser water

#### Heat pump water

#### Equipment drains and overflows

### Pipe: ASTM B88, Type L, hard drawn

### Copper Tubing: ASTM B88, Type DWV, hard drawn piping on equipment drains and overflows only.

### Fittings and Unions (2” and smaller): ASME B16.22 wrought copper and bronze:

#### Solder filler metals: ASTM B32, lead-free alloys.

#### Flux: ASTM B813, water-flushable.

### Joints (All sizes):

#### Copper to copper: AWS A5.8/A5.8M, BCuP-5 (15% silver), Copper-phosphorus alloy.

#### Copper to bronze or steel: AWS A5.8/A5.8M, BAg-1, Silver alloy (45% silver), non-corrosive flux.

### Flanges (2-1/2” and larger): Bronze, 1/16 inch thick preformed neoprene gaskets.

## DIELECTRIC NIPPLE

### Electroplated steel nipple, complying with ASTM F 1545 and IAPMO PS 66.

#### Rated for 300 psig at 225 deg F.

#### Male threaded or grooved end connections.

#### Inert and noncorrosive propylene lining.

Revise pressure rating and temperature in "Pressure Rating" Subparagraph below to suit Project, or insert other options for specific applications.

## VALVES

### CALIBRATED BALANCE VALVES

#### Pre-Set Balance Feature. Valves to be designed to allow Installing Contractor to pre-set balance points for proportional system balance prior to system start-up in accordance with scheduled flow rates.

#### Valve Design and Construction. All valves shall have a calibrated orifice or venturi section, two ¼” threaded pressure tap ports with integral seals, and memory stop to retain the set position. Valves should be rated for 125 psig working pressure and 250 Deg. F maximum operating temperature.

#### Valves shall be selected based on flowrate, not on pipe size dimensions.

#### Preformed Insulation. All valves to be provided with molded insulation to permit access for balance and read-out.

### GATE VALVES

#### Up To and Including 2 Inches:

##### Bronze body, bronze trim, union bonnet, rising stem, lockshield stem handwheel, inside screw with backseating stem, solid wedge disc, alloy seat rings, solder or threaded ends, Class 125, MSS SP-80. Add valve stem extensions to all valves that will be installed in insulated piping systems.

#### Over 2 Inches:

##### Iron body, bronze trim, bolted bonnet, rising stem, handwheel, outside screw and yoke, solid wedge disc with bronze seat rings, flanged or grooved ends, Class 125, MSS SP-70. Add valve stem extensions to all valves that will be installed in insulated piping systems.

##### Chainwheel: On valves 6” and larger and installed higher than 8-feet above finished floor, provide sprocket rim, brackets, and chain compatible with valve.

### BALL VALVES

#### Up To and Including 2 Inches:

##### Bronze two piece body, stainless steel full-port ball on all systems, “glass filled” Teflon seats and stuffing box ring, lever handle with balancing stops, solder or threaded ends. Include stem extensions on valves used in insulated piping systems.

##### Energy isolation ball valves shall be provided with lockable handle.

### BUTTERFLY VALVES

#### 2-1/2 Inches and Larger:

##### Body: Cast or ductile iron with resilient replaceable EPDM seat, lug ends, extended neck.

##### Disc: Aluminum bronze on closed systems and stainless steel on open systems.

##### Stem: Stainless steel, extended on insulated systems as required to allow valve operation without damage to the insulation.

##### Operator (4” and smaller): 10 position lever handle with memory stop, gear drive.

##### Operator (6” and larger): Handwheel, gear drive.

##### Chainwheel: On valves 6” and larger and installed higher than 8-feet above finished floor, provide sprocket rim, brackets, and chain compatible with valve.

### SWING CHECK VALVES

#### Up To and Including 2 Inches:

##### Bronze body, bronze trim, bronze rotating swing disc, with composition disc, solder or threaded ends.

#### Over 2 Inches:

##### Iron body, bronze trim, bronze or bronze faced rotating swing disc, renewable disc and seat, flanged ends.

### SPRING LOADED CHECK VALVES

#### Iron body, bronze trim, split plate, hinged with stainless steel spring, resilient seal bonded to body, wafer or threaded lug ends.

### ALTERNATE MATERIALS

#### Process cooling water systems are to be constructed entirely of materials that do not contain ferrous compounds, except that stainless steel pipe and fittings may be used.

# EXECUTION

## PREPARATION

### Ream pipe and tube ends to full inside diameter using tools designed for this purpose. Remove burrs. Bevel or groove plain end ferrous pipe.

### Remove scale and dirt on inside and outside before assembly.

### Prepare piping connections to equipment with flanges or unions.

### Unions and flanges for servicing and disconnect are not required in installations with grooved mechanical joint couplings. (The couplings shall serve as disconnect points.)

### Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

## INSTALLATION

### Where connecting ferrous and non-ferrous piping materials, use full-port ball valves with bronze construction or a galvanized steel dielectric nipples with plastic liner to separate piping materials.

### Heating water connections to terminal units shall be copper (no steel).

### Install all piping in accordance with ASME B31.9.

### Route piping in orderly manner, parallel to building structure, and maintain gradient.

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

### Group piping whenever practical at common elevations.

### Sleeve pipe passing through partitions, walls and floors as follows:

#### Install schedule 40 pipe sleeves at fire rated walls and floors. Seal with UL approved fire stopping material as specified in 23 05 30.

#### Install minimum 18 gage pipe sleeves at non rated walls.

#### Sleeves through floors should extend a minimum of 2” above finished floor.

#### Sleeves through walls should be flush with the wall surface.

#### All sleeves should be large enough to has insulated piping with crushing the insulation.

### Slope piping and arrange to drain at low points.

### Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

### Refer to Section 23 05 29 and Section 23 05 48 for installation of supports and hangers.

### Provide insulation clearance and access to valves and fittings in hangers and from structure and other equipment. Insulation shall be continuous through all hangers and supports. Refer to Section 23 07 19.

### Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with General Contractor and requirements of Section 23 05 00.

### Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.

### Install unions on both sides of each control valve and on one side of all other valves. Install unions on the equipment side of final connections to each piece of equipment. Unions are not required at flanged valves or equipment or equipment or in grooved joint piping systems.

### Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.

### Prepare unfinished pipe, fittings, supports, and accessories, ready for finish painting.

### Install valves with stems upright or horizontal, not inverted.

### Provide insulated valve stem extensions on all valves installed in insulated piping systems.

### Install chainwheel operators on valves 4” and larger that are installed 8-feet above finished floor or greater. Extend chain down to maximum 5-feet above finished floor.

### Pipe connections shall be installed with the branch piping connected to the top of the main/header. If this is not possible due to space constraints, a connection with the same vertical centerline is acceptable. Connections to the bottom of the main/header is not allowed.

### Hydronic systems shall be designed and constructed with isolation valves at branch taps for all floors.

### Provide solid chrome plated steel escutcheons cover the sleeves and openings at walls and ceilings in exposed areas.

### Process cooling water systems are to be constructed entirely of non-ferrous materials, including but not limited to, piping, pumps, filters, heat exchangers, valves, and air separators. The exception to this is that stainless steel pipe and fittings may be used.

## SYSTEM FLUSHING, FILLING, PRESSURE TESTING AND CLEANING

### Flush, fill, pressure test and clean all new hydronic systems and parts of existing systems which have been altered, extended or repaired.

### Flush and fill systems with all valves open to coils. Bleed air from coils and piping. Clean strainers. Refer to Section 23 25 00.

### Pressure Test Procedure:

#### Submit copy of pipe pressure test log for each section of piping tested. Refer to 23 05 00 for general pipe pressure testing requirements (i.e., test pressure gages, inspections, etc.).

#### Leave joints including welds uninsulated and exposed for examination during the test.

#### Provide temporary restraints for expansion joints which cannot sustain the reactions due to test pressure. If temporary restraints are not practical, isolate expansion joints from testing.

#### Isolate equipment that is not to be subjected to the test pressure from the piping. If a valve is used to isolate the equipment, its closure shall be capable of sealing against the test pressure without damage to the valve. Flanged joints at which blinds are inserted to isolate equipment need not be tested.

#### Install relief valve set at a pressure no more than 1/3 higher than the test pressure, to protect against damage by expansion of liquid or other source of overpressure during the test.

#### Subject piping system to a hydrostatic test pressure which at every point in the system is not less than 1.5 times the design pressure. The test pressure shall not exceed the maximum pressure for any vessel, pump, valve, or other component in the system under test.

#### After the hydrostatic test pressure has been applied for at least 12 hours, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components as appropriate, and repeat hydrostatic test until there are no leaks.

### Clean systems. Refer to Section 23 25 00 for cleaning procedure.

END OF SECTION 23 21 13