SECTION 23 2116 - HYDRONIC PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes certain special-duty valves and specialties for the following:

1. Hot-water heating piping.
2. Chilled-water piping.
3. Condenser-water piping.
4. Glycol cooling-water or heating water piping.
5. Makeup-water piping.
6. Condensate-drain piping.
7. Blowdown-drain piping.
8. Air-vent piping.
9. Safety-valve-inlet and -outlet piping.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of the following:

1. Valves: Include flow and pressure drop curves based on manufacturer's testing for calibrated-orifice balancing valves and automatic flow-control valves.
2. Air-control devices.
3. Hydronic specialties.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air-control devices, hydronic specialties, and special-duty valves to include in emergency, operation, and maintenance manuals.

B. Northwestern University Maintenance Requirement Forms, see Division 01.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Differential Pressure Meter: For each type of balancing valve and automatic flow control valve, include flowmeter, probes, hoses, flow charts, and carrying case.

1.6 QUALITY ASSURANCE

A. Pipe Welding: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code: Section IX.

1. Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

B. Comply with FM Global requirements for pressure vessels and piping and for pressure relief devices.

1.7 SPECIAL WARRANTY

A. Five (5) years, see Division 01.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature unless otherwise indicated:

1. Hot-Water Heating Piping: 100 psig at 200 deg F.
2. Chilled-Water Piping: 120 psig at 50 deg F.
3. Condenser-Water Piping: 120 psig at 50 deg. F.
4. Glycol Cooling-Water Piping: 120 psig at 50 deg. F.
5. Glycol Heating Water Piping: 100 psig at 200 deg F.
6. Makeup-Water Piping: 80 psig 150 deg F.
7. Condensate-Drain Piping: 150 deg F.
8. Blowdown-Drain Piping: Equal to the pressure of the piping system to which it is attached.
9. Air-Vent Piping: Equal to the pressure of the piping system to which it is attached.
10. Safety-Valve-Inlet and -Outlet Piping: Equal to the pressure of the piping system to which it is attached.

2.2 VALVES

A. Check, Ball, and Butterfly Valves: Comply with requirements specified in Section 23 0523 "General Duty Valves for HVAC."

B. Automatic Temperature-Control Valves, Actuators, and Sensors: Comply with requirements specified in Section 25 0000 "Integrated Automation."

C. Bronze, Calibrated-Orifice, Balancing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Bell & Gossett; a Xylem brand.

2. Body: Bronze, ball or plug type with calibrated orifice or venturi.
3. Ball: Brass or stainless steel.
4. Plug: Resin.
5. Seat: PTFE.
6. End Connections: Threaded or socket.
7. Pressure Gage Connections: Integral seals for portable differential pressure meter.
8. Handle Style: Lever, with memory stop to retain set position.
9. CWP Rating: Minimum 125 psig (860 kPa).
10. Maximum Operating Temperature: 250 deg F (121 deg C).

D. Cast-Iron or Steel, Calibrated-Orifice, Balancing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. Bell & Gossett; a Xylem brand.

2. Body: Cast-iron or steel body, ball, plug, or globe pattern with calibrated orifice or venturi.
3. Ball: Brass or stainless steel.
4. Stem Seals: EPDM O-rings.
5. Disc: Glass and carbon-filled PTFE.
6. Seat: PTFE.
7. End Connections: Flanged.
8. Pressure Gage Connections: Integral seals for portable differential pressure meter.
9. Handle Style: Lever, with memory stop to retain set position.
10. CWP Rating: Minimum 125 psig (860 kPa).
11. Maximum Operating Temperature: 250 deg F (121 deg C).

E. Diaphragm-Operated, Pressure-Reducing Valves: ASME labeled.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Bell & Gossett; a Xylem brand.
    b. Conbraco Industries, Inc.
    c. Watts; a Watts Water Technologies company.

2. Body: Bronze or brass.
3. Disc: Glass and carbon-filled PTFE.
4. Seat: Brass.
5. Stem Seals: EPDM O-rings.
6. Diaphragm: EPT.
7. Low inlet-pressure check valve.
8. Inlet Strainer: ***<Insert materials>***, removable without system shutdown.
9. Valve Seat and Stem: Non-corrosive.
10. Valve Size, Capacity, and Operating Pressure: Selected to suit system in which installed, with operating pressure and capacity factory set and field adjustable.

F. Diaphragm-Operated Safety Valves: ASME labeled.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Bell & Gossett; a Xylem brand.

b. Conbraco Industries, Inc.
c. Watts; a Watts Water Technologies company.

2. Body: Bronze or brass.
3. Disc: Glass and carbon-filled PTFE.
4. Seat: Brass.
5. Stem Seals: EPDM O-rings.
6. Diaphragm: EPT.
7. Wetted, Internal Work Parts: Brass and rubber.
8. Inlet Strainer: ***<Insert materials>***, removable without system shutdown.
9. Valve Seat and Stem: Noncorrosive.
10. Valve Size, Capacity, and Operating Pressure: Comply with ASME Boiler and Pressure Vessel Code: Section IV, and selected to suit system in which installed, with operating pressure and capacity factory set and field adjustable.

G. Triple Duty Valves

1. Not Allowed.

H. Automatic Flow-Control Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Flow Design, Inc.
b. Griswold Controls.
c. Nexus Valve, Inc.

2. Body: Brass or ferrous metal.
3. Piston and Spring Assembly: ***[Stainless steel] [Corrosion resistant]***, tamper proof, self-cleaning, and removable.
4. Combination Assemblies: Include bronze or brass-alloy ball valve.
5. Identification Tag: Marked with zone identification, valve number, and flow rate.
6. Size: Same as pipe in which installed.
7. Performance: Maintain constant flow, plus or minus 5 percent over system pressure fluctuations.
8. Minimum CWP Rating: ***[175 psig (1207 kPa)] [300 psig (2070 kPa)]***.
9. Maximum Operating Temperature: ***[200 deg F (93 deg C)] [250 deg F (121 deg C)]***.

2.3 AIR CONTROL DEVICES, EXPANSION TANKS, AND AIR AND DIRT SEPARATORS

A. Manual Air Vents:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Bell & Gossett Domestic Pump; a division of ITT Industries.

2. Body: Bronze.
3. Internal Parts: Nonferrous.
4. Operator: Screwdriver or thumbscrew.
5. Inlet Connection: NPS 1/2.
6. Discharge Connection: NPS 1/8.

7. CWP Rating: 150 psig.
8. Maximum Operating Temperature: 225 deg F.

B. Expansion Tanks:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Bell & Gossett Domestic Pump; a division of ITT Industries.
   b. Amtrol, Inc.

2. Tank: Welded steel, rated for 125-psig working pressure and 375 deg F maximum operating temperature, with taps in bottom of tank for tank fitting and taps in end of tank for gage glass. Tanks shall be factory tested with taps fabricated and labeled according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
3. Pressurization system: Replaceable bladder-type expansion tank which will accommodate the expanded water of the system generated within the normal operating temperature range, limiting this pressure increase at those components in the system to the maximum allowable pressure at those components. It shall maintain minimum operating pressure necessary to eliminate all air. the only air in the system shall be the permanent sealed-in air cushion contained in the replaceable bladder-type tank, with dimensions as indicated on the drawings.

C. Automatic Air Vents:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Bell & Gossett; a Xylem brand.
   b. Nexus Valve, Inc.
   c. Taco, Inc.

2. Body: Bronze or cast iron.
3. Internal Parts: Nonferrous.
4. Operator: Noncorrosive metal float.
5. Inlet Connection: NPS 1/2 (DN 15).
6. Discharge Connection: NPS 1/4 (DN 8).
7. CWP Rating: 150 psig (1035 kPa).
8. Maximum Operating Temperature: 240 deg F (116 deg C).

D. Air and Dirt Separators:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Spirotherm VDR, VDT, VHT, VDN, VHN.
   b. Bell & Gossett; a Xylem brand.

2. Body: ASME welded steel, with inlet and outlet connections, bottom valved blowdown and top vent connections, brass vent head/valve, non-ferrous float, Viton seals and O-rings, brass skim valve, copper coalescing medium, and other internal components that effectively separate the air from solution and divert it to the vent for quick removal, and that effectively remove dirt and divert it for removal.
3. Maximum Working Pressure: 150 psig.

4. Maximum Operating Temperature: 270 deg F.

E. Air Purgers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Bell & Gossett; a Xylem brand.
b. Taco, Inc.

2. Body: Cast iron with internal baffles that slow the water velocity to separate the air from solution and divert it to the vent for quick removal.
3. Maximum Working Pressure: 150 psig (1035 kPa).
4. Maximum Operating Temperature: 250 deg F (121 deg C).

2.4 HYDRONIC PIPING SPECIALTIES

A. Y-Pattern Strainers:

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 (DN 50) and smaller; flanged ends for NPS 2-1/2 (DN 65) and larger.
3. Strainer Screen: Stainless-steel, [**20**] [**40**] [**60**]-mesh strainer, or perforated stainless-steel basket.
4. CWP Rating: 125 psig (860 kPa).

B. Basket Strainers:

1. Body: ASTM A 126, Class B, high-tensile cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 (DN 50) and smaller; flanged ends for NPS 2-1/2 (DN 65) and larger.
3. Strainer Screen: [**40**] [**60**]-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig (860 kPa).

C. T-Pattern Strainers:

1. Body: Ductile or malleable iron with removable access coupling and end cap for strainer maintenance.
2. End Connections: Flanged ends.
3. Strainer Screen: [**40**] [**60**]-mesh startup strainer, and perforated stainless-steel basket with 57 percent free area.
4. CWP Rating: 750 psig (5170 kPa).

D. Stainless-Steel Bellow, Flexible Connectors:

1. Body: Stainless-steel bellows with woven, flexible, bronze, wire-reinforcing protective jacket.
2. End Connections: Threaded or flanged to match equipment connected.
3. Performance: Capable of 3/4-inch (20-mm) misalignment.
4. CWP Rating: 150 psig (1035 kPa).
5. Maximum Operating Temperature: 250 deg F (121 deg C).

E. Spherical, Rubber, Flexible Connectors:

1. Body: Fiber-reinforced rubber body.
2. End Connections: Steel flanges drilled to align with Classes 150 and 300 steel flanges.
3. Performance: Capable of misalignment.
4. CWP Rating: 150 psig (1035 kPa).
5. Maximum Operating Temperature: 250 deg F (121 deg C).

F. Expansion Fittings: Comply with requirements in Section 230516 "Expansion Fittings and Loops for HVAC Piping."Section 15124 "Expansion Fittings and Loops for HVAC Piping."

G. Flexible Stainless Steel Hose Connectors (Up thru 2")

1. Hose: Corrugated 300 series stainless steel.
2. Braided Jacketing: Woven 300 series stainless-steel.
3. End Connections: Threaded (NPT) stainless steel to match equipment connected.
4. Maximum Working Pressure: Minimum of 250 psig @ 200F.
5. Manufacturer's: Flexicraft, Flexonics, or Metraflex (Superflex).

PART 3 - EXECUTION

3.1 VALVE APPLICATIONS

A. Install shutoff-duty valves at each branch connection to supply mains and at supply connection to each piece of equipment.

B. Install ***[throttling-duty] [calibrated-orifice, balancing]*** valves at each branch connection to return main.

C. Install calibrated-orifice, balancing valves in the return pipe of each heating or cooling terminal.

D. Install check valves at each pump discharge and elsewhere as required to control flow direction.

E. Install safety valves at hot-water generators and elsewhere as required by ASME Boiler and Pressure Vessel Code. Install drip-pan elbow on safety-valve outlet and pipe without valves to the outdoors; pipe drain to nearest floor drain or as indicated on Drawings. Comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1, for installation requirements.

F. Install pressure-reducing valves at makeup-water connection to regulate system fill pressure.

G. Install automatic flow control valves as shown on drawings.

H. Install components in accordance with manufacturer's recommendations.

3.2 HYDRONIC SPECIALTIES INSTALLATION

A. Install manual air vents at high points in piping, at heat-transfer coils, and elsewhere as required for system air venting.

B. Install automatic air vents at high points of system piping in mechanical equipment rooms only. Install manual vents at heat-transfer coils and elsewhere as required for air venting.

C. Install piping from boiler air outlet, air separator, or air purger to expansion tank with a 2 percent upward slope toward tank.

D. Install in-line air separators in pump suction. Install drain valve on air separators NPS 2 (DN 50) and larger.

E. Install tangential air separator in pump suction. Install blowdown piping with gate or full-port ball valve; extend full size to nearest floor drain.

F. Install air and dirt separators as shown on drawing and with blowdown piping with gate or full-port ball valve; extend full size to nearest floor drain. These separators are required to be installed for any new chilled water and heating hot water connections to a building, on closed loop hydronic systems involved with renovations, and as otherwise shown on the drawings.

G. Install expansion tanks above the air separator. Install tank fitting in tank bottom and charge tank. Use manual vent for initial fill to establish proper water level in tank.

1. Install tank fittings that are shipped loose.
2. Support tank from floor or structure above with sufficient strength to carry weight of tank, piping connections, fittings, plus tank full of water. Do not overload building components and structural members.

H. Install expansion tanks on the floor. Vent and purge air from hydronic system, and ensure that tank is properly charged with air to suit system Project requirements.

I. Install Y-pattern, basket, and/or T-pattern strainers as shown on the drawings.

J. Install stainless steel bellows type and/or spherical rubber type flexible connectors as shown on the drawings.

K. Install flexible stainless steel hose connectors at HVAC equipment utilizing hydronic piping and as shown on drawings.

L. All valves with position indicators are to be installed so that the indicators are facing in a direction that is visible from floor level. Ball valve handles, if located near ceilings, are to be located on the 3 or 9 o'clock positions to allow for actuation. All butterfly isolation valves that are higher than 5' above the floor are to have chains for actuation. All valves need to have free and clear access, minimum of 24" from valves to adjacent work.

M. This contractor shall install pump differential pressure switches/devices provided by the Division 25 contractor.

END OF SECTION 23 2116