SECTION 232116 - 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 special-duty valves and specialties for the following:

1. Hot-water heating piping.
2. Chilled-water piping.
3. Dual-temperature heating and cooling water piping.
4. Condenser-water piping.
5. Glycol cooling-water piping.
6. Makeup-water piping.
7. Condensate-drain piping.
8. Blowdown-drain piping.
9. Air-vent piping.
10. 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.

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.

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: **<Insert psig (kPa)>** at **[200 deg F (93 deg C)]** **<Insert temperature>**.
2. Chilled-Water Piping: **<Insert psig (kPa)>** at **[200 deg F (93 deg C)]** **<Insert temperature>**.
3. Dual-Temperature Heating and Cooling Water Piping: **<Insert psig (kPa)>** at **[200 deg F (93 deg C)]** **<Insert temperature>**.
4. Condenser-Water Piping: **<Insert psig (kPa)>** at **[150 deg F (66 deg C)]** **<Insert temperature>**.
5. Glycol Cooling-Water Piping: **<Insert psig (kPa)>** at **[150 deg F (66 deg C)]** **<Insert temperature>**.
6. Makeup-Water Piping: **[80 psig (552 kPa)]** **<Insert value>** at **[150 deg F (66 deg C)]** **<Insert temperature>**.
7. Condensate-Drain Piping: **[150 deg F (66 deg C)]** **<Insert temperature>**.
8. Blowdown-Drain Piping: **[200 deg F (93 deg C)]** **<Insert temperature>**.
9. Air-Vent Piping: **[200 deg F (93 deg C)]** **<Insert temperature>**.

HYDRONIC PIPING SPECIALTIES

10. Safety-Valve-Inlet and -Outlet Piping: Equal to the pressure of the piping system to which it is attached.

2.2 VALVES

A. Gate, Globe, Check, Ball, and Butterfly Valves: Comply with requirements specified in Section 230523.11 "Globe Valves for HVAC Piping," Section 230523.12 "Ball Valves for HVAC Piping," Section 230523.13 "Butterfly Valves for HVAC Piping," Section 230523.14 "Check Valves for HVAC Piping," and Section 230523.15 "Gate Valves for HVAC Piping."

B. Automatic Temperature-Control Valves, Actuators, and Sensors: Comply with requirements specified in Section 230923.11 "Control Valves."Section 15901 "Control Valves."

C. Plastic Ball Valves:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Hydronic Components, Inc. (HCi); [**S-605**] [**T-701**] [**S-701**] [**T/S-703**] or comparable product by one of the following:

   a. American Valve, Inc.
   b. Charlotte Pipe and Foundry Company.
   c. Jomar Valve.
   d. Thermoplastic Valves Inc.
   e. Watts Regulator Co.
   f. **<Insert manufacturer's name>**.

2. Body: One-, two-, or three-piece CPVC or PVC to match piping.
3. Ball: Full-port CPVC or PVC to match piping.
4. Seats: PTFE.
5. Seals: EPDM.
6. End Connections: Socket, union, or flanged.
7. Handle Style: Tee shape.
8. CWP Rating: Equal to piping service.
9. Maximum Operating Temperature: Equal to piping service.
10. Comply with MSS SP-122.

D. Plastic Butterfly Valves:

1. Manufacturers: Subject to compliance with requirements, [**provide products by the following**] [**provide products by one of the following**] [**available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following**]:
2. Basis-of-Design Product: Subject to compliance with requirements, provide [**product indicated on Drawings**] **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

   a. American Valve, Inc.
   b. Asahi/America.
   c. Colonial Engineering.
   d. George Fischer Inc.

e. Hayward Industrial Products, Inc.
f. IPEX Inc.
g. Legend Valve.
h. NIBCO INC.
i. Plast-O-Matic Valves, Inc.
j. SMC, The Specialty Mfg. Co.
k. Thermoplastic Valves Inc.
l. Watts Regulator Co.
m. **<Insert manufacturer's name>**.

3. Body: PVC or CPVC to match piping wafer type for installation between flanges.
4. Disc: EPDM-coated steel.
5. Seats: PTFE.
6. Handle Style: Locking lever.
7. CWP Rating: Equal to piping service.
8. Maximum Operating Temperature: Equal to piping service.

E. Plastic Check Valves:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Hydronic Components, Inc. (HCi); S-711 or comparable product by one of the following:

a. American Valve, Inc.
b. Hayward Industrial Products, Inc.
c. Jomar Valve.
d. Thermoplastic Valves Inc.
e. Watts Regulator Co.
f. **<Insert manufacturer's name>**.

2. Body: One-, two-, or three-piece PVC or CPVC to match piping.
3. Ends: Socket or flanged.
4. Seats: PTFE.
5. Check Style: Swing, spring, or ball type.
6. CWP Rating: Equal to piping service.
7. Maximum Operating Temperature: Equal to piping service.

F. Bronze, Calibrated-Orifice, Balancing Valves:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Hydronic Components, Inc. (HCi); [**Terminator B**] [**Terminator B SS**] or comparable product by one of the following:

a. Bell & Gossett Domestic Pump.
b. Flow Design Inc.
c. Griswold Controls.
d. Jomar Hydronics.
e. Tour & Andersson; available through Victaulic Company.
f. **<Insert manufacturer's name>**.

2. Body: Brass or 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).

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

1. Basis-of-Design Product: Subject to compliance with requirements, provide Hydronic Components, Inc. (HCi); Terminator B or comparable product by one of the following:

    a. Armstrong Pumps, Inc.
    b. Gerand Engineering Co.
    c. Griswold Controls.
    d. Jomar Hydronics.
    e. Taco.
    f. **<Insert manufacturer's name>**.

2. Body: Cast-iron or steel body, ball, butterfly, plug, or globe pattern with calibrated orifice or venturi.
3. Ball: Brass or stainless steel.
4. Stem Seals: EPDM O-rings.
5. Disc: Stainless steel or glass and carbon-filled PTFE.
6. Seat: PTFE.
7. End Connections: Flanged or grooved.
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).

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

1. Manufacturers: Subject to compliance with requirements, [**provide products by the following**] [**provide products by one of the following**] [**available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following**]:
2. Basis-of-Design Product: Subject to compliance with requirements, provide [**product indicated on Drawings**] **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

    a. AMTROL, Inc.
    b. Armstrong Pumps, Inc.
    c. Bell & Gossett Domestic Pump.
    d. Conbraco Industries, Inc.
    e. Spence Engineering Company, Inc.
    f. Watts Regulator Co.
    g. **<Insert manufacturer's name>**.

3. Body: Bronze or brass.

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

I. Diaphragm-Operated Safety Valves: ASME labeled.

1. Manufacturers: Subject to compliance with requirements, [**provide products by the following**] [**provide products by one of the following**] [**available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following**]:
2. Basis-of-Design Product: Subject to compliance with requirements, provide [**product indicated on Drawings**] **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

    a. AMTROL, Inc.
    b. Armstrong Pumps, Inc.
    c. Bell & Gossett Domestic Pump.
    d. Conbraco Industries, Inc.
    e. Spence Engineering Company, Inc.
    f. Watts Regulator Co.
    g. **<Insert manufacturer's name>**.

3. Body: Bronze or brass.
4. Disc: Glass and carbon-filled PTFE.
5. Seat: Brass.
6. Stem Seals: EPDM O-rings.
7. Diaphragm: EPT.
8. Wetted, Internal Work Parts: Brass and rubber.
9. Inlet Strainer: **<Insert materials>**, removable without system shutdown.
10. Valve Seat and Stem: Noncorrosive.
11. 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.

J. Automatic Flow-Control Valves:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Hydronic Components, Inc. (HCi); [**Terminator A**] [**Terminator A SS**] or comparable product by one of the following:

    a. Flow Design Inc.
    b. Griswold Controls.
    c. Jomar Hydronics.
    d. Nexus Valve, Inc.
    e. **<Insert manufacturer's name>**.

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

A. Manual Air Vents:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Hydronic Components, Inc. (HCi); [**TV-A**] [**TV-A2**] or comparable product by one of the following:

   a. AMTROL, Inc.
   b. Armstrong Pumps, Inc.
   c. Bell & Gossett Domestic Pump.
   d. Jomar Hydronics.
   e. Taco, Inc.
   f. **<Insert manufacturer's name>**.

2. Body: Brass or bronze.
3. Internal Parts: Nonferrous.
4. Operator: Screwdriver or thumbscrew.
5. Inlet Connection: NPS 1/8 - 1/2 (DN 6 - 15).
6. Discharge Connection: NPS 1/8 (DN 6).
7. CWP Rating: 150 psig (1035 kPa).
8. Maximum Operating Temperature: 225 deg F (107 deg C).

B. Automatic Air Vents:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Hydronic Components, Inc. (HCi); [**AAV-A**] [**AAV-A1**] or comparable product by one of the following:

   a. AMTROL, Inc.
   b. Armstrong Pumps, Inc.
   c. Bell & Gossett Domestic Pump.
   d. Jomar Hydronics.
   e. Taco, Inc.
   f. **<Insert manufacturer's name>**.

2. Body: Brass, bronze, or cast iron.
3. Internal Parts: Nonferrous.
4. Operator: Noncorrosive metal float or hygroiscopic discs.

5. Inlet Connection: NPS 1/8 -1/2 (DN 6 -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).

C. Expansion Tanks:

1. Manufacturers: Subject to compliance with requirements, [**provide products by the following**] [**provide products by one of the following**] [**available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following**]:

   a. AMTROL, Inc.
   b. Armstrong Pumps, Inc.
   c. Bell & Gossett Domestic Pump.
   d. Taco, Inc.
   e. **<Insert manufacturer's name>**.

2. Tank: Welded steel, rated for 125-psig (860-kPa) working pressure and 375 deg F (191 deg C) 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 after taps are fabricated and shall be labeled according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
3. Air-Control Tank Fitting: Cast-iron body, copper-plated tube, brass vent tube plug, and stainless-steel ball check, 100-gal. (379-L) unit only; sized for compression-tank diameter. Provide tank fittings for 125-psig (860-kPa) working pressure and 250 deg F (121 deg C) maximum operating temperature.
4. Tank Drain Fitting: Brass body, nonferrous internal parts; 125-psig (860-kPa) working pressure and 240 deg F (116 deg C) maximum operating temperature; constructed to admit air to compression tank, drain water, and close off system.
5. Gage Glass: Full height with dual manual shutoff valves, [**3/4-inch- (20-mm-)**] **<Insert dimension>** diameter gage glass, and slotted-metal glass guard.

D. [**Diaphragm**] [**Bladder**]-Type Expansion Tanks:

1. Manufacturers: Subject to compliance with requirements, [**provide products by the following**] [**provide products by one of the following**] [**available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following**]:

   a. AMTROL, Inc.
   b. Armstrong Pumps, Inc.
   c. Bell & Gossett Domestic Pump.
   d. Taco, Inc.
   e. **<Insert manufacturer's name>**.

2. Tank: Welded steel, rated for 125-psig (860-kPa) working pressure and 375 deg F (191 deg C) maximum operating temperature. Factory test after taps are fabricated and supports installed and are labeled according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

3. [**Diaphragm**] [**Bladder**]: Securely sealed into tank to separate air charge from system water to maintain required expansion capacity.
4. Air-Charge Fittings: Schrader valve, stainless steel with EPDM seats.

E. Tangential-Type Air Separators:

1. Manufacturers: Subject to compliance with requirements, [**provide products by the following**] [**provide products by one of the following**] [**available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following**]:

   a. AMTROL, Inc.
   b. Armstrong Pumps, Inc.
   c. Bell & Gossett Domestic Pump.
   d. Taco, Inc.
   e. **<Insert manufacturer's name>**.

2. Tank: Welded steel; ASME constructed and labeled for 125-psig (860-kPa) minimum working pressure and 375 deg F (191 deg C) maximum operating temperature.
3. Air Collector Tube: Perforated stainless steel, constructed to direct released air into expansion tank.
4. Tangential Inlet and Outlet Connections: Threaded for NPS 2 (DN 50) and smaller; flanged connections for NPS 2-1/2 (DN 65) and larger.
5. Blowdown Connection: Threaded.
6. Size: Match system flow capacity.

F. In-Line Air Separators:

1. Manufacturers: Subject to compliance with requirements, [**provide products by the following**] [**provide products by one of the following**] [**available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following**]:

   a. AMTROL, Inc.
   b. Armstrong Products, Inc.
   c. Bell & Gossett Domestic Pump.
   d. Taco, Inc.
   e. **<Insert manufacturer's name>**.

2. Tank: One-piece cast iron with an integral weir constructed to decelerate system flow to maximize air separation.
3. Maximum Working Pressure: Up to 175 psig (1207 kPa).
4. Maximum Operating Temperature: Up to 300 deg F (149 deg C).

G. Air Purgers:

1. Manufacturers: Subject to compliance with requirements, [**provide products by the following**] [**provide products by one of the following**] [**available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following**]:

a. AMTROL, Inc.
b. Armstrong Pumps, Inc.
c. Bell & Gossett Domestic Pump.
d. Taco, Inc.
e. **<Insert manufacturer's name>**.

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: Grooved 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."

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.

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 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.

G. 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.

END OF SECTION 232116