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SECTION 232116 - HYDRONIC PIPING SPECIALTIES

TIPS:

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To read **detailed research, technical information about products and materials, and coordination checklists**, click on MasterWorks/Supporting Information.

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:

1. Hydronic specialty valves.
2. Air-control devices.
3. Strainers.
4. Connectors.

B. Related Requirements:

1. Section 230516 "Expansion Fittings and Loops for HVAC Piping" for expansion fittings and loops.

2. Section 230523.11 "Globe Valves for HVAC Piping" for specification and installation requirements for globe valves common to most piping systems.
3. Section 230523.12 "Ball Valves for HVAC Piping" for specification and installation requirements for ball valves common to most piping systems.
4. Section 230523.13 "Butterfly Valves for HVAC Piping" for specification and installation requirements for butterfly valves common to most piping systems.
5. Section 230523.14 "Check Valves for HVAC Piping" for specification and installation requirements for check valves common to most piping systems.
6. Section 230523.15 "Gate Valves for HVAC Piping" for specification and installation requirements for gate valves common to most piping systems.
7. Section 230923.11 "Control Valves" for automatic control valve and sensor specifications, installation requirements, and locations.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product:

1. Include construction details and material descriptions for hydronic piping specialties.
2. Include rated capacities, operating characteristics, and furnished specialties and accessories.
3. Include flow and pressure drop curves based on manufacturer's testing for calibrated-orifice balancing valves and automatic flow-control valves.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For hydronic piping specialties 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 in accordance with ASME Boiler and Pressure Vessel Code: Section IX.

B. 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 SOURCE LIMITATIONS

- A. Source Limitations: Obtain all grooved joint couplings, fittings, valves, and specialties from single source. Obtain grooving tools from same source as grooved components.

2.2 HYDRONIC SPECIALTY VALVES

A. Plastic Ball Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Valve, Inc.
 - b. Asahi/America.
 - c. Charlotte Pipe and Foundry Company.
 - d. Colonial Engineering, Inc.
 - e. Georg Fischer Inc.
 - f. Hayward Flow Control.
 - g. IPEX USA LLC.
 - h. Jomar Valve.
 - i. KBI (King Bros. Industries).
 - j. Legend Valve & Fitting, Inc.
 - k. NIBCO INC.
 - l. Plast-O-Matic Valves, Inc.
 - m. SMC The Specialty Mfg. Co.
 - n. Thermoplastic Valves, Inc.
 - o. WATTS.
 - p. <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.

B. Plastic Butterfly Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Valve, Inc.
 - b. Asahi/America.
 - c. Colonial Engineering, Inc.
 - d. Georg Fischer Inc.
 - e. Hayward Flow Control.
 - f. IPEX USA LLC.
 - g. Legend Valve & Fitting, Inc.
 - h. NIBCO INC.

- i. Plast-O-Matic Valves, Inc.
 - j. SMC The Specialty Mfg. Co.
 - k. Thermoplastic Valves, Inc.
 - l. WATTS.
 - m. **<Insert manufacturer's name>**.
2. Body: PVC or CPVC to match piping wafer type for installation between flanges.
 3. Disc: EPDM-coated steel.
 4. Seats: PTFE.
 5. Handle Style: Locking lever.
 6. CWP Rating: Equal to piping service.
 7. Maximum Operating Temperature: Equal to piping service.
- C. Plastic Check Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Valve, Inc.
 - b. Asahi/America.
 - c. Colonial Engineering, Inc.
 - d. Georg Fischer Inc.
 - e. Hayward Flow Control.
 - f. IPEX USA LLC.
 - g. KBI (King Bros. Industries).
 - h. Legend Valve & Fitting, Inc.
 - i. NIBCO INC.
 - j. Plast-O-Matic Valves, Inc.
 - k. SMC The Specialty Mfg. Co.
 - l. Thermoplastic Valves, Inc.
 - m. WATTS.
 - n. **<Insert manufacturer's name>**.
 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. Bronze, Calibrated-Orifice, Balancing Valves:
1. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company; Series 786 (soldered) and 787 (threaded) or comparable product by one of the following:
 - a. Tour & Andersson; available through Victaulic Company.
 - b. **<Insert engineer-approved manufacturer's name>**.

2. Body: Bronze, DZR Brass Ametal® (copper-alloy) globe type with calibrated orifice or venturi.
3. Disc: Ametal® (copper-alloy).
4. Restriction Cone: Ametal® (copper-alloy).
5. Seat: Ametal® (copper-alloy) with EPDM sealing elastomer.
6. End Connections: Threaded or socket.
7. Stem Seals: EPDM.
8. Pressure Gage Connections: Integral seals for portable differential pressure meter.
9. Handle Style: Handwheel, with memory stop to retain set position.
10. CWP Rating: Minimum 250 psig (1725 kPa).
11. Maximum Operating Temperature: 230 deg F (110 deg C).
12. Coil Hook-Up Connections:
 - a. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company; Koil-Kit Series 799 and Series 79V or comparable product by one of the following:
 - 1) <Insert engineer-approved manufacturer's name>.
 - b. Kit to include:
 - 1) Victaulic Series 786/787/78K circuit balancing valve.
 - 2) Victaulic Series 78Y Strainer-Ball.
 - 3) Victaulic Series 78U Union-Port fitting, with Series 78T ball valve and required hoses.
13. Differential Pressure Controller:
 - a. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company; Series 793 and Series 794 or comparable product by one of the following:
 - 1) <Insert engineer-approved manufacturer's name>.
14. Meter: Provided by the valve manufacturer; to remain with the building owner after commissioning.

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

1. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company; Series 788 (flanged) and Series 789 (grooved) or comparable product by one of the following:
 - a. Tour & Andersson; available through Victaulic Company.
 - b. <Insert engineer-approved manufacturer's name>.
2. Body: Ductile-iron body, globe pattern with calibrated orifice or venturi.
3. Stem Seals: EPDM O-rings.
4. Disc: Ametal® (copper-alloy) or coated ductile iron.
5. Seat: Ametal® or coated ductile iron, with EPDM seal.
6. End Connections: Flanged or grooved.

7. Pressure Gage Connections: Integral seals for portable differential pressure meter.
8. Handle Style: Handwheel, with memory stop to retain set position.
9. CWP Rating: Minimum 250 psig (1725 kPa).
10. Maximum Operating Temperature: 230 deg F (110 deg C).

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

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AMTROL, Inc.
 - b. Apollo Flow Controls; Conbraco Industries, Inc.
 - c. Armstrong Pumps, Inc.
 - d. Bell & Gossett; a Xylem brand.
 - e. Spence Engineering Company, Inc.
 - f. WATTS.
 - g. <Insert manufacturer's name>.
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: Noncorrosive.
10. Valve Size, Capacity, and Operating Pressure: Selected to suit system in which installed, with operating pressure and capacity factory set and field adjustable.

G. Diaphragm-Operated Safety Valves: ASME labeled.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AMTROL, Inc.
 - b. Apollo Flow Controls; Conbraco Industries, Inc.
 - c. Armstrong Pumps, Inc.
 - d. Bell & Gossett; a Xylem brand.
 - e. Spence Engineering Company, Inc.
 - f. WATTS.
 - g. <Insert manufacturer's name>.
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.

H. Automatic Flow-Control Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Caleffi.
 - b. Flow Design, Inc.
 - c. Flowcon Americas LLC.
 - d. Griswold Controls.
 - e. Hays Fluid Controls.
 - f. HCI; Hydronics Components Inc.
 - g. Nexus Valve, Inc.
 - h. NIBCO INC.
 - i. NuTech Hydronic Specialty Products.
 - j. Oventrop Corporation.
 - k. Red-White Valve Corp.
 - l. Tunstall Corporation.
 - m. Victaulic Company.
 - n. <Insert manufacturer's name>.
2. Body: Brass or ferrous metal.
3. Flow Control Assembly, provide either of the following:
 - a. Piston and Spring Assembly: [**Stainless steel**] [**Corrosion resistant**], tamper proof, self-cleaning, and removable.
 - b. Elastomeric Diaphragm and Polyphenylsulfone Orifice Plate: Operating ranges within **2- to 80-psig (14- to 550-kPa)** differential pressure.
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 within plus or minus 10 percent, regardless of 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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AMTROL, Inc.
 - b. Apollo Flow Controls; Conbraco Industries, Inc.
 - c. Armstrong Pumps, Inc.

- d. Bell & Gossett; a Xylem brand.
 - e. Hays Fluid Controls.
 - f. HCI; Hydronics Components Inc.
 - g. Nexus Valve, Inc.
 - h. NuTech Hydronic Specialty Products.
 - i. TACO Comfort Solutions, Inc.
 - j. **<Insert manufacturer's name>**.
2. Body: Bronze.
 3. Internal Parts: Nonferrous.
 4. Operator: Screwdriver or thumbscrew.
 5. Inlet Connection: **NPS 1/2 (DN 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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AMTROL, Inc.
 - b. Armstrong Pumps, Inc.
 - c. Bell & Gossett; a Xylem brand.
 - d. Nexus Valve, Inc.
 - e. NuTech Hydronic Specialty Products.
 - f. Spirotherm, Inc.
 - g. TACO Comfort Solutions, Inc.
 - h. **<Insert manufacturer's name>**.
 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)**.
- C. Expansion Tanks:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AMTROL, Inc.
 - b. Armstrong Pumps, Inc.
 - c. Bell & Gossett; a Xylem brand.
 - d. Flo Fab Inc.
 - e. TACO Comfort Solutions, Inc.
 - f. **<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 in accordance with 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 ASME Expansion Tanks:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AMTROL, Inc.
 - b. Armstrong Pumps, Inc.
 - c. Bell & Gossett; a Xylem brand.
 - d. Flo Fab Inc.
 - e. TACO Comfort Solutions, Inc.
 - f. <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 in accordance with 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. Diaphragm-Type Non-ASME Expansion Tanks:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AMTROL, Inc.
 - b. Apollo Flow Controls; Conbraco Industries, Inc.
 - c. Armstrong Pumps, Inc.
 - d. Bell & Gossett; a Xylem brand.
 - e. Flo Fab Inc.
 - f. TACO Comfort Solutions, Inc.
 - g. <Insert manufacturer's name>.
2. Tank: Carbon steel, rated for minimum 100-psig (690-kPa) working pressure at minimum 200 deg F (115 deg C) maximum operating temperature. Non-ASME construction.

3. Diaphragm: Securely sealed into tank to separate air charge from system water to maintain required expansion capacity.
- F. Air-Charge Fittings: Schrader valve, stainless steel with EPDM seats.
- G. Coalescing-Type Air and Dirt Separators:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Armstrong Pumps, Inc.
 - b. Bell & Gossett; a Xylem brand.
 - c. Spirotherm, Inc.
 - d. <Insert manufacturer's name>.
 2. Tank: Fabricated steel tank; ASME constructed and stamped for 125-psig (862-kPa) working pressure and 270 deg F (130 deg C) maximum operating temperature.
 3. Coalescing Medium: [**Copper**] [**Stainless steel**] <Insert material>.
 4. Air Vent: Threaded to the top of the separator.
 5. Inline Inlet and Outlet Connections: Threaded for NPS 2 (DN 50) and smaller; Class 150 flanged connections for NPS 2-1/2 (DN 65) and larger.
 6. Blowdown Connection: Threaded to the bottom of the separator.
 7. Size: Match system flow capacity.
- H. Tangential-Type Air Separators:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AMTROL, Inc.
 - b. Armstrong Pumps, Inc.
 - c. Bell & Gossett; a Xylem brand.
 - d. TACO Comfort Solutions, 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.
- I. In-Line Air Separators:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AMTROL, Inc.
 - b. Armstrong Products, Inc.

- c. Bell & Gossett; a Xylem brand.
 - d. Spirotherm, Inc.
 - e. TACO Comfort Solutions, Inc.
 - f. **<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)**.

J. Air Purgers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AMTROL, Inc.
 - b. Armstrong Pumps, Inc.
 - c. Bell & Gossett; a Xylem brand.
 - d. Spirotherm, Inc.
 - e. TACO Comfort Solutions, Inc.
 - f. **<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 STRAINERS

A. Y-Pattern Strainers:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company; Style 732 and W732, or comparable product by one of the following:
 - a. **<Insert engineer-approved manufacturer's name>**.
2. Body:
 - a. ASTM A126, Class B, cast iron with bolted cover and bottom drain connection.
 - b. ASTM A536, Grade 65-45-12, ductile iron with coupled cover and drain connection in cap.
3. End Connections: Threaded ends for **NPS 2 (DN 50)** and smaller; grooved ends for **NPS 2-1/2 (DN 65)** and larger.
4. Strainer Screen: Stainless steel, frame and mesh strainer, or perforated stainless steel basket.
5. CWP Rating: **300 psig (2065 kPa)**.

B. Basket Strainers:

1. Body: ASTM A126, 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. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company; Style 730 and W730, or comparable product by one of the following:
 - a. **<Insert engineer-approved manufacturer's name>**.
2. Body: Ductile iron with removable access coupling and end cap for strainer maintenance.
 - a. Factory-fabricated carbon steel with T-bolt hinged closure for strainer maintenance.
3. End Connections: Grooved ends.
4. Strainer Screen: Perforated stainless steel basket with 2:1 total free area.
5. CWP Rating: **300 psig (2065 kPa)**.

2.5 CONNECTORS

A. 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)**.

B. 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)**.

C. Triple Duty Valve Assembly:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company; MasterSeal butterfly valve with memory stop and a Victaulic Series 779 Venturi-Check, or comparable product by one the following:
 - a. **<Insert engineer-approved manufacturer name>**.

2. Water Service: Rated to 230 deg F (110 deg C).
 3. Pressure Rating: 300 psi (2065 kPa) maximum.
- D. Triple Duty Valve Assembly: For 14-inch (356 mm) through 24-inch (610 mm) sizes.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company; AGS-Vic300 butterfly valve with Series W715 AGS check valve, or comparable product by one of the following:
 - a. <Insert engineer-approved manufacturer's name>.
 2. Pressure Rating: 230 psi (1575 kPa) maximum.
- E. Factory-fabricated grooved end header (manifold) all-in-one assembly for fluid distribution.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company; Vic-Header or comparable product by one of the following:
 - a. <Insert engineer-approved manufacturer's name>.
 2. Header to consist of an ASTM A53, Grade B, standard weight pipe spool with required outlet connections.
 3. Grooved ends: Roll grooved to [OGS] [AGS] dimensions, with enamel coating or galvanized to project requirements.
- F. Factory-Assembled Grooved End Vibration Pump Drops: 3 inches through 12 inches (DN 80 though DN 300). Orange enamel coated installation-ready assembly with flexible couplings to accommodate vibration attenuation and stress relief. Rated for working pressure to 300-psig (2068-kPa).
1. Discharge Drop: Class 150 flange for pump connection, [base elbow for horizontal pump connection] [straight line with concentric reducer for vertical pump connections], tri-service valve assembly consisting of a spring-actuated check [Venturi-Check] valve and butterfly valve with offset stem for 360-degree circumferential seating, and pipe spool with thermometer and pressure ports.
 - a. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company; Series 380 or comparable product by one of the following:
 - 1) <Insert engineer-approved manufacturer's name>.
 2. Suction Drop: Suction diffuser with stainless steel basket and diffuser and Class 150 flange for pump connection, butterfly valve with offset stem for 360-degree circumferential seating, and pipe spool with thermometer and/or pressure ports.
 - a. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company; Series 381 or comparable product by one of the following:
 - 1) <Insert engineer-approved manufacturer's name>.

3. Suction Drop: 90-degree base elbow with Class 150 flange for pump connection, Wye pattern strainer with stainless steel perforated metal basket, butterfly valve with offset stem for 360-degree circumferential seating, and pipe spool(s) with thermometer and/or pressure ports.
 - a. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company; Series 382 or comparable product by one of the following:
 - 1) <Insert engineer-approved manufacturer's name>.

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