

SECTION 230523 – VALVES FOR HVAC PIPING SYSTEMS

Latest Update: 08-10-2024 See Underlined Text for Edits.

(Engineer shall edit specifications and blue text in header to meet project requirements. This includes but is not limited to updating Equipment and/or Material Model Numbers indicated in the specifications and adding any additional specifications that may be required by the project. Also turn off all “Underlines”.)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section and all other sections of Division 23.

1.2 SUMMARY

- A. This section includes the requirements for shutoff, drain, specialty, and check valves installed in HVAC piping systems as follows: <Edit for the project.>
 - 1. Hydronic ball valves.
 - 2. Hydronic butterfly valves.
 - 3. Hydronic check valves.
 - 4. Hydronic special valves.
 - 5. Refrigerant system valves.
 - 6. Fuel oil system valves.<Add other equipment as required for the project>

1.3 ACTION SUBMITTALS

- A. Product Data: For each specified product, include manufacturers cut sheets, dimensional data, performance data, installation instructions, finishes, specified options, and warranty information. Identify valves for each HVAC system application.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: Include a copy of each approved submittal along with any applicable maintenance data in the project operation and maintenance manual.
- B. In addition to the approved submittals, for each valve type, include the manufacturers printed exploded view type parts and material list indicating how to dismantle, repair and reassemble the valve, and identifying each part.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: The installer shall be a qualified licensed installer within the jurisdiction and familiar with the installation of the valves specified herein for each piping system.
- B. Compliance: Comply with the following:
 - 1. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
 - 2. ASME B31.1 for power piping valves.
 - 3. ASME B31.9 for building services piping valves.
- C. Press End Valve Compliance: Valves in progress piping systems shall be in compliance with ASME B31.9 for building service piping valves.
- D. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

1.6 PERFORMANCE REQUIREMENTS

- A. Compatibility: Products shall be suitable for piping service fluids, materials, working pressures, and temperatures.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Information in this article is paraphrased from MSS.
- B. Prepare valves for shipping as follows:
 - 1. Protect internal parts against rust and corrosion.
 - 2. Protect threads, flange faces, grooves, and weld ends.
 - 3. Set ball and plug valves open to minimize exposure of functional surfaces.
 - 4. Set butterfly valves closed or slightly open.
 - 5. Block check valves in either closed or open position.
- C. Use the following precautions during storage:
 - 1. Maintain valve end protection.
 - 2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.
- D. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use hand wheels or stems as lifting or rigging points.

1.8 WARRANTY/GUARANTEE

- A. See Division 23 Specification Section “Basic Mechanical Requirements – HVAC” for warranty and guarantee requirements.

PART 2 - PRODUCTS

2.1 GENERAL PRODUCT REQUIREMENTS

- A. Equipment Design and Selection: Valves shall be designed and selected, for the intended use, in accordance with the requirements of this specification.
- B. Acceptable Manufacturers: Subject to compliance with requirements, provide lead free plumbing valves by one (1) of the following:
1. Ball Valves – Copper and Steel Piping Systems:
 - a. Apollo.
 - b. Milwaukee.
 - c. Watts.
 - d. Viega. (copper press systems only)
 2. Butterfly Valves – Copper and Steel Piping Systems:
 - a. Bray.
 - b. Milwaukee.
 3. Check Valves – Copper and Steel Piping Systems:
 - a. Apollo.
 - b. Milwaukee.
 - c. Watts.
 4. Special Valves:
 - a. Watts.
 - b. Spence.
 - c. Wilkens.
 5. Refrigerant System Valves:
 - a. Mueller Refrigeration Products.
 - b. Danfoss Refrigeration Products.
 - c. Parker Refrigeration Products.
 6. Fuel Oil System Valves:
 - a. Shut off valves: Apollo.
 - b. Pressure relief valves: OPW Engineering, Franklin Fuel Systems or Webster Fuel Pumps.
 - c. Oil safety valves. Same as paragraph ‘b’.

- d. Emergency shut off valves: OPW Engineering, Franklin Fuel Systems, or EMCO Wheaton.
- C. See shut off, drain, & specialty valve application below for required valves.
- D. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- E. Valve Sizes: Same as upstream/downstream piping unless otherwise indicated.
- F. Valve Operator Types:
1. Ball Valves: Handles.
 2. Butterfly Valves:
 - a. Manual Gear Operators: For shut off duty.
 - b. Chainwheel Operator: For shut off duty.
 - c. Electronic Actuators: For BAS control valve duty. Valve and Actuator by BAS contractor.
- G. Valves in Insulated Piping: With two (2) inch stem extensions and the following features:
1. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
 2. Butterfly Valves: With extended neck.
- H. Valve-End Connections:
1. Threaded Ball Valves: With threads according to ASME B1.20.1.
 2. Flanged Butterfly Valves: With flanges according to ASME B16.1 for iron valves.
 3. Press End Ball Valves: Where press end piping systems are used.
 4. Solder End Ball Valves: Where specified. **<Delete for UMB Projects>**
- I. Provide chain operators in place of valve handles for valves installed in piping systems ten (10) feet or higher above the finished floor of mechanical equipment rooms.
- 2.2 SHUT OFF, DRAIN, AND SPECIALITY VALVE APPLICATIONS
<Delete valves not applicable to project>
- A. General Application: All Valves installed in HVAC, Steam and Steam Condensate Piping Systems shall be as specified below. For this application, HVAC Piping Systems and Specialty Valves are defined as follows:

1. HVAC Water Piping Systems: Includes Heating Hot Water, Chilled Water, Process Cooling Water, Condenser Water, Energy Recovery, Piping utilizing solder joint, press end, threaded, flanged and/or welded pipe joint methods.
 2. Steam Piping Systems: Includes Medium Pressure (60 psig) Steam and Condensate, utilizing threaded, flanged and/or welded pipe joint methods.
 3. Drain and Specialty Valves: Valves used at system drain points and at connections for P/T Plugs, DP Switches, & Pressure Gages utilizing solder joint, screw joint and/or press end pipe joint methods.
 4. Special Valves: Used as solenoid valves, pressure reducing valves, pressure/temperature/relief valves, safety relief valves, and pressure regulating valves.
 5. Refrigerant System Valves: Used as diaphragm valves, check valves, service valves, solenoid valves, safety relief valves, thermal expansion valves, and hot gas bypass valves. <Delete if not Required>
 6. Fuel Oil System Valves: Used as shut off valves, safety valve and relief valves. <Delete if not Required>
 7. BAS Control Valves: Provide a valved bypass across BAS control valves located in hydronic piping systems at AHU coils and primary/secondary loop valves.
 8. Ball valves shall be full port valves as specified unless otherwise noted.
- B. Shut Off, Drain and Specialty Valves – UMB Campus: Gate Valves will not be permitted for installation in these systems. Only listed manufacturers and model numbers below are acceptable to UMB.
1. Shut Off Valves for Hydronic Solder Joint Piping Systems:
 - a. Piping Systems One Half (1/2) Inch to Two (2) Inch: Use Two (2) Piece Full Port Lead Free Ball Valves and Trim as indicated below:
 - 1) Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a) Apollo: 77FLF-140 Series, Brass Body. (FP)
 - b) Milwaukee: UPBA400S Series, Bronze Body. (FP)
 - c) Watts: LFB6080G2-SS, Bronze Body. (FP)
 - 2) Description:
 - a) Standard: MSS SP-110.
 - b) Lead Free Certification: NSF61 and NSF/ANSI 372.
 - c) SWP Rating: 150 psig.
 - d) CWP Rating: 600 psig.
 - e) Body Design: Two piece.

- f) Body Material: Bronze or Brass.
 - g) Ends: Threaded.
 - h) Seats and Seals: RPTFE.
 - i) Stem: Type 316 Stainless steel.
 - j) Ball: Type 316 Stainless steel, vented.
 - k) Port: Full (FP).
 - l) Handle: Lever Type.
 - m) Lead free valve.
 - n) Stem Extensions: Provide stem extensions for valves used in cold water service, (chilled water and cold make up water)
2. Shut Off Valves for Hydronic ProPress (Press End) Piping Systems: (Contractor Option)
- a. Piping Systems One Half (1/2) Inch to Two (2) Inch: Use Two (2) Piece Full Port Lead Free Ball Valves and Trim as indicated below:
 - 1) Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a) Viega: 2971.3ZL, Bronze Body
 - b) Apollopress: 77WLF-140, Bronze Body.
 - c) Milwaukee: BA480S, Brass Body.
 - 2) Description:
 - a) Standard: MSS SP-110.
 - b) SWP Rating: 150 psig.
 - c) CWP Rating: 600 psig.
 - d) Body Design: Two (2) piece.
 - e) Body Material: Bronze.
 - f) Ends: Press ends, smart connect feature.
 - g) Seats and Seals: EPDM or PTFE.
 - h) Stem: Type 316 Stainless steel.
 - i) Ball: Type 316 Stainless steel, vented.
 - j) Port: Full.
 - k) Handle: Lever Type.
 - l) Lead free valve.
 - b. Piping Systems Two and One Half (2-1/2) Inch to Four (4) Inch: Use Bi-directional dead end service general purpose butterfly valves as indicated below:

- 1) Manufacturers: Subject to compliance with requirements, provide products by products by one (1) of the following:
 - a) Bray – Series 31H with Trim 390.
 - b) Milwaukee – HL Series
- 2) Description:
 - a) Standard: MSS SP-68.
 - b) CWP Rating: 285 psig at 100°F
 - c) Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
 - d) Body Material: Ductile Iron.
 - e) Seat: EPDM double seal seats and seals.
 - f) Stem: 416 stainless steel stem.
 - g) Disc: Nylon – 11 coated ductile iron disk.
 - h) Service: Bidirectional.
 - i) Valve Duty: Shut off or balancing.
 - j) Valve Operation: Manual gear operator with hand wheel.
 - k) Chain Operators: Provide chain operators for shut off valves installed in piping systems ten (10) feet or higher above the finished floor of Mechanical Equipment Rooms.
 - l) Extensions: Where necessary provide an extension for the wheel handle output shaft for the hand wheel to clear pipe insulation.
 - m) Memory Stops: Where valves are indicated to be used as balancing valves on details provide a memory stop for this valve duty.
3. Shut Off Valves for Hydronic Welded and Victaulic Piping Systems: (Contractor Option - Victaulic)
 - a. Piping Systems Two and One Half (2-1/2) Inches and Larger: Use Bi-directional dead end service general purpose butterfly valves as indicated below:
 - 1) Manufacturers: Subject to compliance with requirements, provide products by products by one (1) of the following:
 - a) Bray – Series 31H with trim 390.
 - b) Milwaukee – HL Series.
 - 2) Description:

- a) Standard: MSS SP-68.
 - b) CWP Rating: 285 psig at 100°F
 - c) Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
 - d) Body Material: Ductile Iron.
 - e) Seat: EPDM double seal seats and seals.
 - f) Stem: 416 stainless steel stem.
 - g) Disc: Nylon – 11 coated ductile iron disk.
 - h) Service: Bidirectional.
 - i) Valve Duty: Shut off or balancing.
 - j) Valve Operation: Manual gear operator with hand wheel.
 - k) Chain Operators: Provide chain operators for shut off valves installed in piping systems ten (10) feet or higher above the finished floor of Mechanical Equipment Rooms.
 - l) Extensions: Where necessary provide an extension for the wheel handle output shaft for the hand wheel to clear pipe insulation.
 - m) Memory Stops: Where valves are indicated to be used as balancing valves on details provide a memory stop for this valve duty.
4. Drain and Specialty Valves for all Hydronic Water Piping Systems:
- a. Drain Valves for Piping Systems One Half (1/2) Inch to Two (2) Inch: Use Three Quarter (3/4) Piece Full Port Lead Free Ball Valves and Trim as indicated below:
 - 1) Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a) Apollo: 77FLF-140 Series, Brass Body. (FP)
 - b) Milwaukee: UPBA400S Series, Bronze Body. (FP)
 - c) Watts: LFB6080G2-SS, Bronze Body. (FP)
 - 2) Description:
 - a) Standard: MSS SP-110.
 - b) Lead Free Certification: NSF61 and NSF/ANSI 372.
 - c) SWP Rating: 150 psig.
 - d) CWP Rating: 600 psig.
 - e) Body Design: Two (2) piece.
 - f) Body Material: Bronze or Brass.

- g) Ends: Threaded.
 - h) Seats and Seals: RPTFE.
 - i) Stem: Type 316 Stainless steel.
 - j) Ball: Type 316 Stainless steel, vented.
 - k) Port: Full.
 - l) Handle: Lever Type.
 - m) Lead free valves.

- b. Drain Valves for Piping Systems Two and One Half (2-1/2) Inch and Larger: Use Two (2) Inch, Two (2) Piece Full Port Lead Free Ball Valves with Stainless Steel Trim as indicated below:
 - 1) Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a) Apollo: 77FLF-140 Series, Brass Body. (FP)
 - b) Milwaukee: UPBA400S Series, Bronze Body. (FP)
 - c) Watts: LFB6080G2-SS, Bronze Body. (FP)

 - 2) Description:
 - a) Standard: MSS SP-110.
 - b) Lead Free Certification: NSF61 and NSF/ANSI 372.
 - c) SWP Rating: 150 psig.
 - d) CWP Rating: 600 psig.
 - e) Body Design: Two piece.
 - f) Body Material: Bronze or Brass.
 - g) Ends: Threaded.
 - h) Seat and Seals: RPTFE.
 - i) Stem: Type 316 Stainless steel.
 - j) Ball: Type 316 Stainless steel, vented.
 - k) Port: Full.
 - l) Handle: Lever Type.
 - m) Lead free valves.
 - n) Two and One Half (2-1/2) inch capped fire hose connection.

- c. Specialty Valves for Piping Systems: Use One Quarter (1/4) Inch Two (2) Piece Full Port Lead Free Ball Valves and Trim as indicated below:
 - 1) Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a) Apollo: 77FLF-140 Series, Brass Body. (FP)

- b) Milwaukee: UPBA400S Series, Bronze Body. (FP)
 - c) Watts: LFB6080G2-SS, Bronze Body. (FP)
- 2) Description:
- a) Standard: MSS SP-110.
 - b) Lead Free Certification: NSF61 and NSF/ANSI 372.
 - c) SWP Rating: 150 psig.
 - d) CWP Rating: 600 psig.
 - e) Body Design: Two piece.
 - f) Body Material: Bronze or Brass.
 - g) Ends: Threaded.
 - h) Seats and Seals: RPTFE.
 - i) Stem: Type 316 Stainless steel.
 - j) Ball: Type 316 Stainless steel, vented.
 - k) Port: Full.
 - l) Handle: Lever Type.
 - m) Lead free valves.
5. Shut Off Valves for HVAC Steam and Condensate Threaded and Welded Piping Systems:
- a. Piping Systems One Half (1/2) Inch through Two (2) Inch: Use Two (2) Piece Full Port Carbon Steel Ball Valves and Trim as indicated below:
 - 1) Manufacturers: Subject to compliance with requirements, provide products by products by one (1) of the following:
 - a) Apollo –73A–140-64.
 - b) Milwaukee – 20CSOR-03-XH.
 - c) Watts – C-FBV-1.
 - 2) Description:
 - a) Standard: MSS SP-72.
 - b) CWP Rating: 200 psig.
 - c) Body Design: Split body.
 - d) Body Material: Carbon Steel.
 - e) Ends: Threaded.
 - f) Seats and Seals: RPTFE.
 - g) Stem: Stainless steel.
 - h) Ball: Stainless steel.
 - i) Port: Full.

- b. Piping Systems Two and One Half (2-1/2) through Four (4) Inch: Use Bi-directional dead end service high performance butterfly valve as indicated below.
- 1) Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a) Bray – Series 41 with trim 466.
 - b) Milwaukee – HP Series.
 - 2) Description:
 - a) Standard: MSS SP-68.
 - b) CWP Rating: 285 psig at 100°F
 - c) Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
 - d) Body Material: Carbon steel.
 - e) Seats and Seals: RTFE seats and TFE seals.
 - f) Stem: 17-4 PH stainless steel
 - g) Disc: 316 Stainless steel.
 - h) Service: Bidirectional.
 - i) Valve Duty: Shut off.
 - j) Valve Operator: Manual gear operator with hand wheel.
 - k) Extensions: Where necessary provide an extension for the wheel handle output shaft for the hand wheel to clear pipe insulation.
- c. Specialty Valves for Piping Systems: Use One Quarter (1/4) Inch through Three Quarter (3/4) Inch, Two (2) Piece Full Port Carbon Steel Ball Valves and Trim as indicated below:
- 1) Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a) Apollo: 73A-140-64.
 - b) Milwaukee: 20CSOR-03-XH.
 - c) Watts: C-FBV-1
 - 2) Description:
 - a) Standard: MSS SP-110.
 - b) SWP Rating: 250 psig.

- c) CWP Rating: 600 psig.
 - d) Body Design: Two piece.
 - e) Body Material: Carbon Steel.
 - f) Ends: Threaded.
 - g) Seats and Seals: RTPFE.
 - h) Stem: Stainless Steel.
 - i) Ball: Stainless Steel.
 - j) Port: Full.
 - k) Handle: Lever Type.
6. Shut Off Valves for HVAC Non Laboratory Natural Gas Threaded Piping Systems:
- a. Piping Systems One Quarter (1/4) Inch to One (1) Inch: Use Two (2) Piece Full Port Ball Valves and Trim as indicated below:
 - 1) Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a) Apollo: 94A Series.
 - b) Watts: FBV – 3C – UL/FM.
 - 2) Description:
 - a) Standard: MSS SP-110.
 - b) Gas Approvals: UL Guide ‘YRPV’, ASME B16.38 and ASME B16.44.
 - c) SWP Rating: 150 psig.
 - d) CWP Rating: 600 psig.
 - e) Body Design: Two piece.
 - f) Body Material: Bronze.
 - g) Ends: Threaded.
 - h) Seats and Seals: RPTFE.
 - i) Stem: Brass.
 - j) Ball: Chrome Plated Brass, vented.
 - k) Port: Full.
 - l) Handle: Lever Type.
 - b. Piping Systems One and One Quarter (1-1/4) Inch to Three (3) Inch: Use Two (2) Piece Full Port Ball Valves and Trim as indicated below:
 - 1) Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

- a) Apollo: 94A Series.
 - b) Watts: FVB – 3C-UL/FM. (1-1/4 inch – 2 inch)
- 2) Description:
- a) Standard: MSS SP-110.
 - b) Gas Approvals: UL Guide ‘YRPV’, ASME B16.38 and ASME B16.44.
 - c) SWP Rating: 150 psig.
 - d) CWP Rating: 600 psig.
 - e) Body Design: Two piece.
 - f) Body Material: Bronze.
 - g) Ends: Threaded.
 - h) Seats and Seals: RPTFE.
 - i) Stem: Chrome Plated Brass.
 - j) Ball: Chrome Plated Brass, vented.
 - k) Port: Full.
 - l) Handle: Lever Type.
7. BAS Control Valves for HVAC Piping Systems:
- a. BAS Control Valves for Piping Systems Two and One Half (2-1/2) Inch and Larger: See Division 23 Specification Section “Control Valves and Dampers” for valve types.
 - b. These valves shall be provided by the BAS contractor and installed in the piping systems by the mechanical contractor including isolation valves. All required connections to the BAS shall be by the BAS contractor.
- 2.3 CHECK VALVES <Delete check valves not applicable to project>
- A. Two and One half (2-1/2) inches and smaller use – Bronze Lift Check Valves as indicated below:
- 1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a. Apollo
 - b. Milwaukee Valve Company.
 - c. Watts.
 - 2. Description:

- a. Standard: MSS SP-80, Type 3.
- b. CWP Rating: 200 psig.
- c. Body Design: Horizontal flow.
- d. Body Material: ASTM B 62, bronze.
- e. Ends: Threaded.
- f. Disc: Bronze.

B. Three (3) inches and Larger – Use Bronze Lift Check Valves as indicated below:

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

- a. Milwaukee Valve Company.
- b. Watts Regulator Co.

- 2. Description:

- a. Standard: MSS SP-71, Type I.
- b. NPS 2-1/2 to NPS 12, CWP Rating: 200 psig.
- c. NPS 14 to NPS 24, CWP Rating: 150 psig.
- d. Body Design: Clear or full waterway.
- e. Body Material: ASTM A 126, gray iron with bolted bonnet.
- f. Ends: Flanged.
- g. Trim: Bronze.
- h. Gasket: Asbestos free.

C. Bronze Lift Check Valves – Use Class 125, Lift Check Valves with Bronze Disc as indicated below:

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

- a. Crane Co.; Crane Valve Group; Crane Valves.
- b. Crane Co.; Crane Valve Group; Jenkins Valves.
- c. Crane Co.; Crane Valve Group; Stockham Division.

- 2. Description:

- a. Standard: MSS SP-80, Type 1.
- b. CWP Rating: 200 psig.
- c. Body Design: Vertical or horizontal flow.
- d. Body Material: ASTM B 61 or ASTM B 62, bronze.
- e. Ends: Threaded.

- f. Disc: Bronze or Buna rubber with stainless steel holder threaded or soldered end connections.

2.4 SPECIAL VALVES

- A. Solenoid Valves: Aluminum body, 120 volts AC, 60 Hz, Class B continuous duty molded coil; NEMA 4 coil enclosure; electrically opened/electrically closed; dual coils; normally closed; UL and FM approved and labeled.
- B. Pressure Reducing Valves:
 - 1. Provide as manufactured by Watts Regulator, Spence, or approved equal.
 - 2. Hydronic Systems: diaphragm operated, cast-iron or brass body valve, with low inlet pressure check valve, inlet strainer removable without system shut-down, and noncorrosive valve seat and stem. Select valve size, capacity, and operating pressure to suit system. Valve shall be factory-set at operating pressure and have the capability for field adjustment.
- C. Safety Relief Valves:
 - 1. 125 psig working pressure and 250°F maximum operating temperature; designed, manufactured, tested, and labeled in accordance with the requirements of Section IV of the ASME Boiler and Pressure Vessel Code.
 - 2. Valve body shall be cast-iron.
 - 3. Valve shall have forged copper alloy disc, fully enclosed cadmium plated steel spring with adjustable pressure range and positive shut-off.
 - 4. Factory set valves to relieve at 10 psi above operating pressure.
 - 5. For steam systems, provide tap at base of elbow for connection to F & T trap per UMB standard detail.
- D. Combined Pressure/Temperature Relief Valves: <Designer shall schedule BTUH relief capacity on the drawings>
 - 1. Hydronic Systems: diaphragm operated, cast-iron or brass body valve, with low inlet pressure check valve, inlet strainer removable without system shut-down, and noncorrosive valve seat and stem. Select valve size, capacity, and operating pressure to suit system. Valve shall be factory-set at operating pressure and have the capability for field adjustment. Safety relief valve designed, manufactured, tested, and labeled in accordance with the requirements of Section IV of the ASME Boiler and Pressure Vessel Code. Valve body shall be cast-iron, with all wetted internal working parts made of brass and rubber; 125 psig working pressure and 250°F maximum operating temperature. Select valve to suit actual system pressure and Btu capacity. Provide with fast fill feature for filling hydronic system.

E. Pressure-Regulating Valves - Hydronic Systems:

1. Single-seated, direct-operated type, having bronze body with integral strainer and complying with requirements of ASSE Standard 1003. Select proper size for maximum flow rate and inlet and outlet pressures indicated.
2. Prefabricated reducing systems with shut-off valves shall be permitted; however, shut-off valves shall be as specified herein, and unions shall be provided for removal of regulator.

F. Pressure Regulating Valves - Steam and Condensate:

1. General: Select pressure reducing valves of size, capacity, and pressure rating as scheduled. Factory-set for inlet and outlet pressures as indicated.
2. Valves Characteristics: Pilot-actuated, diaphragm type, with adjustable pressure range and positive shut-off; cast iron body with flanged end connections, hardened stainless steel trim, and replaceable valve head and seat. Provide main head stem guide fitted with flushing and pressure arresting device. Provide cover over pilot diaphragm for protection against dirt accumulation.

2.5 REFRIGERANT SYSTEM VALVES

A. Diaphragm Packless Valves:

1. Body and Bonnet: Cast bronze; globe design with straight-through or angle pattern.
2. Diaphragm: Phosphor bronze and stainless steel with stainless-steel spring.
3. Operator: Rising stem and hand wheel.
4. Seat: Nylon.
5. End Connections: Socket, union, or flanged.
6. Working Pressure Rating: 500 psig.
7. Maximum Operating Temperature: 275°F.

B. Check Valves:

1. Body: Ductile iron, forged brass, or cast bronze; globe pattern.
2. Bonnet: Bolted ductile iron, forged brass, or cast bronze; or brass hex plug.
3. Piston: Removable polytetrafluoroethylene seat.
4. Closing Spring: Stainless steel.
5. Retain first subparagraph below for optional manual opening feature.
6. Manual Opening Stem: Seal cap, plated-steel stem, and graphite seal.
7. End Connections: Socket, union, threaded, or flanged.
8. Maximum Opening Pressure: 0.50 psig.
9. Working Pressure Rating: 500 psig.
10. Maximum Operating Temperature: 275°F.

C. Service Valves:

1. Body: Forged brass with brass cap including key end to remove core.
2. Core: Removable ball-type check valve with stainless-steel spring.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Copper spring.
5. Working Pressure Rating: 500 psig.

D. Solenoid Valves: Comply with ARI 760 and UL 429; listed and labeled by an NRTL.

1. Body and Bonnet: Plated steel.
2. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Threaded.
5. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch conduit adapter, and [24] [115] [208]-<Indicate voltage>V ac coil.
6. Working Pressure Rating: 400 psig.
7. Maximum Operating Temperature: 240°F.
8. Subparagraph below is an optional feature.
9. Manual operator.

E. Safety Relief Valves: Comply with ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.

1. Body and Bonnet: Ductile iron and steel, with neoprene O-ring seal.
2. Piston, Closing Spring, and Seat Insert: Stainless steel.
3. Seat Disc: Polytetrafluoroethylene.
4. End Connections: Threaded.
5. Working Pressure Rating: 400 psig.
6. Maximum Operating Temperature: 240°F.

F. Thermostatic Expansion Valves: Comply with ARI 750.

1. Body, Bonnet, and Seal Cap: Forged brass or steel.
2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
3. Packing and Gaskets: Non-asbestos.
4. Capillary and Bulb: Copper tubing filled with refrigerant charge.
5. Suction Temperature: [40°F] <Insert temperature>.
6. Superheat: Adjustable.
7. Reverse-flow option (for heat-pump applications).
8. End Connections: Socket, flare, or threaded union.
9. Working Pressure Rating: [700 psig] [450 psig] <Insert value>.

G. Hot-Gas Bypass Valves: Comply with UL 429; listed and labeled by an NRTL.

1. Body, Bonnet, and Seal Cap: Ductile iron or steel.
2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
3. Packing and Gaskets: Non-asbestos.
4. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
5. Seat: Polytetrafluoroethylene.
6. Equalizer: [Internal] [External].
7. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch conduit adapter, and [24] [115] [208]-<Indicate voltage>V ac coil.
8. End Connections: Socket.
9. Throttling Range: Maximum 5 psig.
10. Working Pressure Rating: 500 psig.
11. Maximum Operating Temperature: 240°F.

2.6 FUEL OIL SYSTEM – SHUT OFF AND SPECIALTY VALVES

A. Manual Shut off Valves:

1. Ball Valves: One Quarter (1/2) Inch to Three (3) Inch: Use Two (2) Piece Full Port Ball Valves and Trim as indicated below:
 - a. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - 1) Apollo Valves: 94A Series.
 - 2) Milwaukee: BA-475B.
 - b. Description:
 - 1) Standard: MSS SP-110.
 - 2) Fuel Oil Approvals: UL Guide ‘YRXB’, ASME B16.38 and ASME B16.44.
 - 3) SWP Rating: 150 psig.
 - 4) CWP Rating: 600 psig.
 - 5) Body Design: Two piece.
 - 6) Body Material: Bronze.
 - 7) Ends: Threaded.
 - 8) Seats: Modified Teflon double seal seats and Teflon seals.
 - 9) Stem: Brass.
 - 10) Ball: Chrome Plated Brass, vented.
 - 11) Port: Full.
 - 12) Handle: Lever Type.

B. Pressure Relief Valves:

1. Listed and labeled for fuel-oil service by an NRTL acceptable to authorities having jurisdiction.
2. Body: Brass, bronze, or cast steel.
3. Springs: Stainless steel, interchangeable.
4. Seat and Seal: Nitrile rubber.
5. Orifice: Stainless steel, interchangeable.
6. Factory Applied Finish: Baked enamel.
7. Maximum Inlet Pressure: <Insert pressure>.
8. Relief Pressure Setting: <Insert pressure>.

C. Oil Safety Valves:

1. Listed and labeled for fuel oil service by an NRTL acceptable to authorities having jurisdiction.
2. Body: Brass, bronze, or cast steel.
3. Springs: Stainless steel.
4. Seat and Diaphragm: Nitrile rubber.
5. Orifice: Stainless steel, interchangeable.
6. Factory-Applied Finish: Baked enamel.
7. Manual override port.
8. Maximum Inlet Pressure: 60 psig.
9. Maximum Outlet Pressure: 3 psig.

D. Emergency Shutoff Valves:

1. Listed and labeled for fuel oil service by an NRTL acceptable to authorities having jurisdiction.
2. Single poppet valve.
3. Body: ASTM A 126, cast iron.
4. Disk: FPM.
5. Poppet Spring: Stainless steel.
6. Stem: Plated brass.
7. O Ring: FPM.
8. Packing Nut: PTFE coated brass.
9. Fusible link to close valve at 165°F.
10. Thermal relief to vent line pressure buildup due to fire.
11. Air test port.
12. Maximum Operating Pressure: 0.5 psig.

- E. Vertical Ball Check Valves: Class 200, 400 psig maximum operating pressure, two (2) piece bronze construction with threaded end connections; integral bronze seats and replaceable stainless steel ball.

2.7 WET TAP PROCESS <Delete if not Required>

- A. General: When existing HVAC hydronic systems cannot be shut off and drained for new connections the contractor shall make arrangements with UMB to wet tap the system requiring new connections as follows:
 - 1. Piping Systems up to Four (4) Inches: Use an Apollo 77FLF-140 full port ball valve only as specified. Size the valve to match the new pipe connection.
 - 2. Piping Systems Six (6) Inches and Larger: Provide an appropriately sized gate valve for the wet tap process. Provide a specified butterfly valve downstream of the gate valve for shut off duty. Size the butterfly valve to match the new pipe connection. Lock the gate valve in the open position.

PART 3 - EXECUTION

3.1 GENERAL

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine threads on valve and mating pipe for form and cleanliness.
- D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

- A. Valves shall be placed in such manner as to be easily accessible for smooth and easy hand wheel operation and packing maintenance.
- B. Install valves in piping systems were shown on drawings, diagrams and details and were indicated below:

1. To Isolate:
 - a. Motorized flow control valves.
 - b. Equipment.
 - c. Pipe risers.
 - d. Branch piping.

 2. To Drain:
 - a. Low points in piping systems.
 - b. Pipe risers.
 - c. Equipment.
 - d. Trapped sections in the piping system.

 3. To Balance:
 - a. Flow to equipment and coils.
- C. Where piping or equipment may be subsequently removed, provide valves with bodies having integral flanges or full lugs drilled and tapped to hold valve in place so that downstream piping or equipment can be disconnected and replaced with blank-off plate while valve is still in service.
- D. Valves for equipment and controls shall be installed full size of pipe before reducing size to make equipment connection.
- E. Where there is no interference, shut-off valves shall be installed with handwheel up on horizontal runs of pipe to prevent accumulation of foreign matter in working parts of valves. In no case shall the stem be installed below the pipe centerline.
- F. On valves, strainers, etc., installed in copper piping, provide a union on the discharge side of each valve and threaded adapters where copper piping connects to valves, strainers, etc.
- G. Drawings indicate the general arrangement of piping, fittings, and specialties.
- H. Install valves with unions or flanges at each piece of equipment arranged to allow servicing, maintenance, and equipment removal without system shutdown.
- I. Install valves in a position to allow full handle movement.
- J. Install safety relief valves on hot water generators, boilers, pressure vessels, etc. and elsewhere as required by ASME Boiler and Pressure Vessel Code. Pipe discharge without valves as shown on drawings, or to nearest floor drain if not shown on drawings. Comply with ASME Boiler and Pressure Vessel Code Section VIII, Division 1 for installation, requirements.

- K. Install shut-off valves upstream and downstream of each pressure regulator.
- L. Where threaded ball valves are installed in brazed copper piping systems braze each threaded adapter on to the piping. After each adapter has cooled to the touch install the threaded ball valve. Do not connect the threaded adapter to the valve and then braze the adapter and valve to the piping as this will result in damage to the valve seals. If any valve, in the brazed piping systems are damaged due to faulty installation the damaged valves shall be replaced by the contractor at no cost to the University.
- M. Where butterfly valves are installed in copper piping systems provide companion flanges and dielectric gasket kits for each flange. When valves and/or fittings are installed in piping where electrolysis may occur provide dielectric unions at each connection.
- N. Locate valves for easy access and provide separate support where necessary.
- O. Install valves in horizontal piping with stem at or above center of pipe.
- P. Install valves in position to allow full stem movement.
- Q. Install chain wheels on operators for ball and butterfly valves four (4) inches and larger and more than ten (10) feet above floor. Extend chains to sixty (60) inches above finished floor. This requirement is limited to mechanical equipment rooms only.
- R. Install check valves for proper direction of flow and as follows:
 - 1. Swing Check Valves: In horizontal position with hinge pin level.
 - 2. Lift Check Valves: With stem upright and plumb.

3.3 SPECIAL VALVE APPLICATIONS

- A. Install pressure relief valves and temperature/pressure relief valves were indicated on the drawings and where required for proper system operation.

3.4 FUEL OIL SYSTEM – VALVE AND SPECIALTY INSTALLATION

- A. Install manual fuel oil shutoff valves on branch connections to fuel oil appliance.
- B. Install valves in accessible locations.
- C. Install oil safety valves at inlet of each oil fired appliance.
- D. Install pressure relief valves in distribution piping between the supply and return lines.
- E. Install manual air vents at high points in fuel oil piping.

- F. Install emergency shutoff valves at dispensers.

3.5 ADJUSTING

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.6 THREADED CONNECTIONS

- A. Note the internal length of threads in valve ends and proximity of valve internal seat or wall to determine how far pipe should be threaded into valve.
- B. Align threads at point of assembly.
- C. Apply appropriate tape or thread compound to the external pipe threads, except where dry seal threading is specified.
- D. Assemble joint, wrench tight. Wrench on valve shall be on the valve end into which the pipe is being threaded.

3.7 FLANGED CONNECTIONS

- A. Align flange surfaces parallel.
- B. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly with a torque wrench.
- C. For dead-end service, butterfly valves require flanges both upstream and downstream for proper shutoff and retention.

3.8 PRESS END CONNECTIONS

- A. Press end connections shall be made according to the manufacturer's installation instructions.
- B. Where thread end valves are installed in press end piping systems, provide threaded adaptors for each valve and follow manufacturer's installation instructions.
- C. Where flanged valves are installed in press end piping systems, provide flange connections for each valve and follow manufacturer's installation instructions.

3.9 REFRIGERANT VALVE APPLICATIONS

- A. Install diaphragm packless valves in suction and discharge lines of compressor.
- B. Install service valves for gauge taps at inlet and outlet of hot-gas bypass valves and strainers if they are not an integral part of valves and strainers.

<Retain paragraph below if suction line will be exposed to air temperatures less than 75°F (24°C) during compressor operation.>

- C. Install a check valve at the compressor discharge and a liquid accumulator at the compressor suction connection.
- D. Except as otherwise indicated, install diaphragm packless valves on inlet and outlet side of filter dryers.
- E. Install a full-sized, three-valve bypass around filter dryers.

<Retain paragraph below for solenoid valves on systems with multiple thermostatic expansion valves. Retain for hot-gas bypass valve if not integral to the valve.>

- F. Install solenoid valves upstream from each expansion valve and hot-gas bypass valve. Install solenoid valves in horizontal lines with coil at top.
- G. Install thermostatic expansion valves as close as possible to distributors on evaporators.
 - 1. Install valve so diaphragm case is warmer than bulb.
 - 2. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Do not mount bulb in a trap or at bottom of the line.
 - 3. If external equalizer lines are required, make connection where it will reflect suction-line pressure at bulb location.
- H. Install safety relief valves where required by ASME Boiler and Pressure Vessel Code. Pipe safety-relief-valve discharge line to outside according to ASHRAE 15.

END OF SECTION 220523