

GENERAL DUTY VALVES FOR HVAC PIPING

PART 1 - DESIGN DIRECTIVES

1.1 SUMMARY

- A. Section includes general duty valves common to most mechanical piping systems. Special duty valves are specified in individual piping system specifications.
- B. Valves used in fire protection systems are not included in this section

1.2 DESIGN CRITERIA

- A. Consultant is to confirm the application of the specified valves to insure suitability of use in the specified systems.
- B. Dynamic Flow Control Valves:
 - 1. Preferred method of hydronic balancing. Utilize wherever possible in water piping systems.
 - 2. Must have a wye strainer with a 20-mesh stainless steel screen upstream of the valve.
 - 3. Use of pre-assembled dynamic flow control packages are encouraged for use at coils in AHU's and VAV boxes, and other critical hydronic terminals.
 - 4. Conventional type balancing valves are listed for use where dynamic valves are not practical.
- C. Globe or Ball Valves: Use as bypass valves for control valves.
 - 1. If there is a back-up system with another set of control valves, or if the system is determined by FO&M as non-critical, bypass valves are not required.
- D. Pressure Independent Control (PIC) Valves: Preferred by Dartmouth College instead of balancing valves.
 - 1. Balancing Valves: Not to serve double duty as isolation valves.
 - a. Use when balancing flow through equipment, i.e. heat exchangers, separate coils at units.
- E. Hi-Performance Butterfly Valves: Steam service and building hot and chilled water isolation.
- F. Triple duty valves are not allowed.
- G. Wafer type butterfly valves are not allowed.

1.3 QUALITY ASSURANCE

- A. American Society of Mechanical Engineers (ASME) Compliance: Comply with ASME B31.9 for building services piping and ASME B31.1 for power piping.

- B. Manufacturers Standardization Society of the Valve and Fittings Industry (MSS)
Compliance: Comply with the various MSS Standard Practices referenced.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Keep valves in original shipping containers in a dry location until ready for installation.

PART 2 - PRODUCTS

2.1 VALVE FEATURES, GENERAL

- A. In mechanical spaces only, provide chain wheel operators, for valves 2-1/2 inch and larger installed 96 inches or higher above finished floor elevation. Extend chains to an elevation of 60 inches above finished floor elevation.
- B. Where insulation is indicated or specified, provide extended stems of suitable length to accommodate the insulation.

2.2 BALL VALVES

- A. Ball Valves, 2-1/2 inch and Smaller: Carbon Steel Body. Full port two-piece construction.
 - 1. Ball : 316 stainless-steel
 - 2. Stem; 316 stainless-steel. Blowout proof. Extended stem for insulated piping
 - 3. Seats and Seals: Replaceable TFE
 - 4. Handle: Vinyl covered steel
 - 5. Ends: Threaded
 - 6. Saturated Steam Pressure Rating: 150 psi
 - 7. WOG Pressure: 2000 psi; 1/4 through 1-inch
 - 8. WOG Pressure: 1500 psi; 1-1/4 inch through 2-inch
 - 9. Acceptable manufacturers
 - a. Apollo: 73A-14 series.
 - b. Viega
 - c. Milwaukee
 - d. Watts
- B. Ball Valves, 3 inch and smaller: Bronze/Brass/Copper body, lead free. Regular port two-piece construction. Full port.
 - 1. Ball: B-16 chrome plated
 - 2. Stem: B-16 chrome plated. Blowout-proof. Extended stem for insulated piping
 - 3. Seats and Seals: TFE
 - 4. Handle: Vinyl covered steel
 - 5. Ends: Threaded, solder or press
 - 6. Saturated Steam Pressure: 150 psi saturated steam pressure.
 - 7. WOG Pressure: 400 psi
 - 8. Acceptable Manufacturers:
 - a. Apollo: 77FLF-200, 77FLF-100, 77WLF series
 - b. Milwaukee
 - c. Viega

- d. Watts. Series LFFBV
- C. Low Point Drain Valves: $\frac{3}{4}$ -inch inlet. Bronze body. Regular port, two-piece construction.
 - 1. Ball: B-16 chrome plated steel
 - 2. Blowout Proof Stem: B-16 chrome plated steel
 - 3. Seats and Seals: TFE
 - 4. Handle: Vinyl covered steel
 - 5. System End: Thread, solder, or press
 - 6. Opposite End: $\frac{3}{4}$ -inch hose connection with brass cap
 - 7. Saturated Steam Pressure: 150 psi
 - 8. WOG Pressure: 400 psi
 - 9. Acceptable manufacturers:
 - a. Apollo: 70-LF-100-HC series

2.3 GLOBE VALVES

- A. Globe Valves, 2 inches and Smaller: 125 SWP, body and union bonnet of ASTM A 338 malleable iron.
 - 1. Disc and Stem: 13% chromium stainless steel
 - 2. Packing: TFE impregnated, non-asbestos
 - 3. Handwheel
 - 4. Ends: Threaded
 - 5. Acceptable manufacturer: Powell, Milwaukee, Crane

2.4 BUTTERFLY VALVES

- A. Steam service, and building hot and chilled water isolation (not for Automation Control):
 - 1. Hi-Performance Butterfly Valves 2-1/2 inch and Larger: MSS SP 67; Lug type, bi directional valves. ANSI Class 150 carbon steel body conforming to ASTM A 216, type WCB.
 - a. Disc: 316 stainless-steel
 - b. Shaft: 17-4 PH stainless steel
 - c. Packing: Filled (reinforced) TFE with TFE packing or extreme seats and enhanced filled TFE packing
 - d. Seat Retainer Ring: Bolted in place with stainless steel bolts
 - e. Lever Operators: Locks for sizes 2 through 4 inch
 - f. Gear Operators: With position indicator for sizes 6 inch or greater
 - g. Acceptable manufacturers:
 - 1) Flowseal: 1LA-121RTG
 - 2) Neles-Jamesbury: Wafer Sphere #815-L-11-2236XZ
 - 3) Bray: Series 41
- B. Potable Water Service:
 - 1. Butterfly Valves, 2-1/2 inch and Larger: MSS SP-67. Resilient seated lug type. Ductile iron body

- a. Disc: Aluminum, bronze or 316 stainless steel. Constant contact with seat. Concentric self-centering style. Free floating without the use of pins or fasteners.
- b. Shaft: Stainless steel.
- c. Seat: EPDM rated for minus 20 to 250 degrees F.
- d. Valve 12 inches or Smaller: Pressure Rating: 175 psi minimum.
- e. Valve 12 inches or Larger: Pressure Rating: 150 psi minimum.
- f. Lever Operators with Locks: For sizes 2 through 4 inch
- g. Gear Operators with Position Indicator: For sizes 6 inch or greater.
- h. Acceptable manufacturers:
 - 1) Bray: 31 Series.
 - 2) Demco: NE-C series.

2.5 CHECK VALVES

- A. Swing Check Valves, 2 inches and Smaller: MSS SP-80 & MSS SP-139, as applicable, Class 125 and 150; cast bronze body and cap conforming to ASTM B-62. Lead Free.
 1. Swing: Horizontal swing
 2. Pattern: Y,
 3. Disc: Bronze.
 4. Ends; Class 125: Threaded, solder or press.
 5. Ends; Class 150: Threaded
 6. Capable of being reground while the valve remains in the line.
 7. Class 150: Where system pressure requires or where Class 125 valves are not available.
 8. Non-Potable Systems:
 - a. Acceptable manufacturers:
 - 1) Apollo: Threaded: 161T-LF Series. Solder: 161S-LF Series
 - 2) Milwaukee Valve: Threaded: 509. Solder: 1509.
 - 3) Watts:
 9. Potable systems:
 - a. Acceptable manufacturers:
 - 1) Apollo: Threaded: 161T-LF for potable systems)
 - 2) Apollo: Soldered: 161S-LF for potable systems)
- B. Swing Check Valves, 2 inches and Smaller: MSS SP-80 Class 300; cast bronze body and cap conforming to ASTM B-61;
 1. Swing: Horizontal swing
 2. Pattern: Y,
 3. Disc: Bronze.
 4. Ends: Threaded
 5. Capable of being reground while the valve remains in the line.
 6. Capable of being reground while the valve remains in the line.
 7. Acceptable manufacturers:

- a. Apollo: Threaded: 169T Series
- 8. Swing Check Valve, 2 inches and Smaller: Malleable iron body, cap, disc and hinge conforming to ASTM A-338, 300 psi SWP, threaded ends.
- 9. Acceptable manufacturers:
 - a. Powell: 1847 Series.
- C. Swing Check Valve, 4 inch and Larger: MSS SP-71, class 250 cast iron body and cap,
 - 1. Disc for Valves 6 inches or Smaller: Bronze (ASTM B-62)
 - 2. Disc for Valves Larger than 6 inches: Bronze faced iron disk and hinge.
 - 3. Acceptable manufacturers:
 - a. Crane: 39E and 373
 - 4. Spring Loaded Silent Check Valve, Steam condensate, 3 inch and smaller: MSS SP-61. 18-8 stainless steel construction throughout including guard cage, spring, valve disc, retaining ring and seat. Wafer type. Fully rebuildable.
 - 5. Non-shock Pressure Rating: 300 psi
 - 6. Acceptable manufacturer:
 - a. Durable: BSS
- D. Split Disc Wafer Check Valves: Cast iron body 125lb, ASTM A126-B. Non-slam design, lapped and balanced twin bronze valve plates. Designed to open and close at approximately one-foot differential pressure.
 - 1. Seat: Replaceable EPDM, Trim: 316 stainless-steel
 - 2. Torsion Spring: 316 stainless-steel.
 - 3. Acceptable manufacturers:
 - a. Mueller: 71-A-H-B-6-H.
 - b. Technocheck: 5050.
- E. Wafer Check Valves: Cast iron body, 125lb., ASTM A126, non-slam design/
 - 1. O-Ring: Replaceable Buna 'N' or Viton
 - 2. Disc: 304 stainless-steel,
 - 3. Pin and Spring: 316 stainless-steel
 - 4. Acceptable manufacturers:
 - a. Check Rite: Model 210

2.6 GLOBE TYPE BALANCING VALVE:

- A. Provisions for measuring differential pressure, flow rates, flow temperature and air venting as an integral part of the valve body and be of the globe style, wye pattern design.
- B. Shutoff: 100% positive. Leakproof shutoff against same fluid pressure as valve body pressure rating.
- C. Manufacturer's preformed insulation covers when valves are installed in insulated piping systems.

- D. 3/8 inch through 2 inch: Brass copper alloy construction.
 - 1. Connections: Solder NPT.
 - 2. Minimum of four, 360° rotations of handwheel for maximum setting.
- E. 2-1/2 inch and larger: Cast iron body. All other parts of nonferrous copper alloy construction
 - 1. Connections: flanged.
 - 2. Eight or twelve 360° rotations of handwheel for maximum setting.
- F. Acceptable manufacturers
 - 1. Tour & Andersson: STAD & STAF
 - 2. Armstrong: CBV-T & CBV-G

2.7 MANUAL BALL TYPE BALANCING VALVE

- A. Bronze body, brass ball construction. Teflon seat suitable for use in domestic water systems.
 - 1. Differential pressure ports .
 - 2. Drain/purge port.
 - 3. Memory stop.
 - 4. Calibrated name plate.
 - 5. Optional – Combination balancing valve and strainer. No EPDM O-rings.
- B. Acceptable manufacturers:
 - 1. Tour & Andersson, TA Series manual balancing valve (for HVAC).
 - 2. Bell & Gossett – Circuit Setter (for Plumbing)
 - 3. Taco – Accu-Flo (for Plumbing)

2.8 PRESSURE INDEPENDENT BALANCING VALVES:

- A. Pressure Independent Balancing Valves:
 - 1. Flow Control Cartridge Assembly: Precision ground, stainless steel.
 - a. Two PSID control ranges: Control flow within 5% of rated flow.
 - 1) Minimum range capable of being activated by 2 PSID
 - b. Pressure and temperature test ports
 - c. Permanently marked to show direction of flow
 - d. Body tag to indicate flow rate, model number, and PSID control range.
 - e. Warranted by manufacturer for five years from date of shipment.
 - 2. Automatic Valves, 2 inches and smaller:
 - a. Bronze Body Rating: 300 PSI up to 250°F
 - b. End connection: NPT
 - c. Cartridge to be removable without disturbing piping system
 - d. Flow Rates: 0.55 to 22.0 GPM in a 2-32 psid range

- e. Acceptable Manufacturers:
 - 1) Flow Design, Inc: Model YR
 - 2) Nexus: Ultramatic
 - 3) Macon
 - 4) Tour & Andersson
- 3. Pre-assembled systems, 2 inch and smaller:
 - a. Bronze Body Rating: 300 PSI up to 250°F.
 - b. End connection: NPT
 - c. Cartridge to be removable without disturbing piping system.
 - d. Flow Rates: 0.55 to 22.0 GPM in a 2-32 psid range.
 - e. Strainer, blowdown, and one pressure/ temperature port .
 - f. Supply Side Component: A single device incorporating an isolation ball valve.
 - g. Return Side: Include an accessible flow control valve, isolation valve, two pressure/ temperature ports and the control valve.
- B. Automatic valves, greater than 2-inch:
 - 1. Ductile or gray iron body be rated at 150 PSI
 - 2. Flange end connections or be a wafer design.
 - 3. Available flow rates of 18 GPM to 6,400 GPM in a 2-32 psid range
 - 4. Acceptable Manufacturers:
 - a. Flow Design, Inc: Model WS
 - b. Nexus: Ultramatic
 - c. Macon
 - d. Tour & Andersson

Refer to CONTROL VALVES (6-WAY AND BELIMO ENERGY VALVE) in Section 25 0000 – HVAC Instrumentation and Controls.

PART 3 - EXECUTION

3.1 VALVE INSTALLATIONS

- A. Use ball or butterfly valves for shut off-duty; globe, ball, or butterfly for throttling duty. Refer to piping system specification sections for specific valve applications and arrangements.
- B. Locate valves in accessible locations, e.g. locate in rooms rather than congested corridors.
- C. Install isolation valves and unions for each fixture, control valve and any item or equipment that would require service, whether or not shown on the contract documents, arranged to allow equipment removal without system shutdown or draining. Install isolation valves at all main branches.
- D. Install valves in horizontal piping with stem at or above the center of the pipe and in a position to allow full stem movement.

- E. In mechanical spaces only, provide chain wheel operators for valves 2 ½" and larger, installed 96" or higher above finish floor elevation. Extend chains to an elevation of 66" above finished floor.
- F. Installation of Check Valves: Install for proper direction of flow as follows:
 - 1. Swing Check Valves: Horizontal position with hinge pin level.
 - 2. Wafer Check Valves: Horizontal or vertical position, between flanges.
- G. Install drain valves at the low points of all piping (except in LP gas) systems and at all drip legs.
- H. Install automatic flow control valves per the manufacturer's written instructions and the following criteria:
 - 1. All automatic flow control valves shall have a 20-mesh strainer upstream of the valve.
- I. Where automatic flow control valves control multiple heating devices (i.e. risers, entire floors, etc.), install a valve with a strainer upstream and an isolation valve downstream. Where automatic flow control valves control individual heating terminals, install pre-assembled systems (strainers on inlet and valves on outlet).
- J. Where butterfly type valves are installed as end of service, and are not rated as such, install a minimum 12-inch-long spool piece with weld neck flanges and a blind flange.

3.2 CONNECTIONS

- A. Refer to Division 15 standards, "BASIC PIPING MATERIALS AND METHODS".
- B. For solder connections close ball valves to the full closed position, open globe valves to full-open position.

3.3 FIELD QUALITY CONTROL

- A. After piping systems have been tested and put into service, but before final adjusting and balancing, inspect valves for leaks. Adjust or replace packing to stop leaks; replace valves if leak persists.

3.4 VALVE APPLICATIONS

- A. Domestic Hot and Cold Water: Bronze bodied ball, globe, and check valves.
- B. HVAC Water Systems, less than or equal to 210°F:
 - 1. Resilient seated cast iron butterfly valves
 - 2. Bronze bodied ball, and check valves for copper piping systems.
- C. Steel Piping Systems:
 - 1. Forged Steel Ball Valves:
 - 2. Check and Globe Valves:
 - a. 2 inches or smaller: Bronze or malleable iron.

- b. Greater than 2 inches: Malleable iron.
- 3. Resilient seated cast iron body butterfly valves.
- D. Chilled water and hot water systems where piping enters building from central distribution system:
 - 1. High performance butterfly valves
- E. Steam and Gravity Condensate:
 - 1. Ball Valves: Stainless steel
 - 2. High-performance butterfly valves: Carbon steel
 - 3. Check Valves: Malleable iron; all sizes
- F. Condensate Pump Discharge: Use Spring Loaded Silent Check Valve.
- G. Non-slam check valves: Install at discharges of reciprocating equipment, i.e. pump discharges including condensate pumps.
- H. Balancing Valves:
 - 1. For HVAC applications, manual balancing valves are preferred. Pressure independent balancing valves may be acceptable, consult with FO&M Engineering.
 - 2. Use ball type balancing valves in domestic hot water recirculating systems.
 - 3. Globe type balancing valves are used in special situations; consult with FO&M Engineering.
 - 4. Balancing valves shall not be used in applications where Pressure Independent Control (PIC) Valves are used.

3.5 VALVE PRESSURE/TEMPERATURE CLASSIFICATION SCHEDULES

- A. Valves 2 inches and smaller:
 - 1. Domestic Hot and Cold Water:
 - a. Ball Valve: 150 wog. Valve size may be extended to include less than or equal to 3-inch pipeline size.
 - b. Check Valve: 125
 - c. Globe Valve: 125
 - 2. HVAC Systems less than or equal to 210 degrees F Supply and Return:
 - a. Ball Valve: 150 wog. Valve size may be extended to include less than or equal to 3-inch pipeline size.
 - b. Check Valve: 150
 - c. Globe Valve: N/A
 - 3. Steam, Gravity & Pumped Condensate Return less than or equal to 30 psig:
 - a. Ball Valve: 150 wog
 - b. Check Valve: 300
 - c. Globe Valve: 125

B. Valves 2-1/2 inches and Larger:

1. Domestic Hot and Cold Water:
 - a. Ball Valve: 150
 - b. Check Valve: 125
 - c. Globe Valve: N/A
2. HVAC Systems less than or equal to 210 degrees F Supply and Return:
 - a. Ball Valve: 150
 - b. Check Valve: 150
 - c. Globe Valve: N/A
3. Steam, Gravity & Pumped Condensate Return less than or equal to 30 psig:
 - a. Ball Valve: 150
 - b. Check Valve: 300
 - c. Globe Valve: 125

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