SECTION 23 05 23

GENERAL-DUTY VALVES FOR HVAC PIPING

**BASED ON DFD MASTER SPECIFICATION DATED 1/31/2024**

This section has been written to cover most (but not all) situations that you will encounter. Depending on the requirements of your specific project, you may have to add material, delete items or modify what is currently written. The Division of Facilities Development expects changes and comments from you.

# P A R T 1 - G E N E R A L

## SCOPE

This section includes valve specifications for all HVAC systems except where indicated under Related Work. Included are the following topics:

PART 1 - GENERAL

Scope

Related Work

Reference

Quality Assurance

Submittals

Operation and Maintenance Data

Design Criteria

PART 2 - PRODUCTS

Manufacturers

Bypass Valves

Water System Valves

Gate Valves

Ball Valves

Butterfly Valves (System – Not Chilled Water Building Entrance)

Butterfly Valves (Chilled Water Building Entrance)

Globe Valves

Swing Check Valves

Spring Loaded Check Valves

Balance Valves

Drain Valves

Combination Shut-off, Check, and Balancing Valves

Water Pressure Reducing Valves

Water Relief Valves

Self-Contained Control Valves

Low Pressure Steam/Condensate (15 psig or less)

Gate Valves

Butterfly Valves

Globe Valves

Swing Check Valves

Spring Loaded Check Valves

Drain Valves

Safety Valves

Steam Pressure Reducing Valves

High Pressure Steam/Condensate (Building Service over 15 psig)

Gate Valves

Butterfly Valves

Globe Valves

Swing Check Valves

Drain Valves

Safety Valves

Steam Pressure Reducing Valves

High Pressure Steam/Condensate (Distribution over 15 psig)

Gate Valves

Triple Offset Butterfly Valves (Steam)

Double Offset Butterfly Valves (Condensate)

Globe Valves

Piston/Swing Check Valves

Drain Valves

Safety Valves

Steam Pressure Reducing Valves

High Pressure Steam/Condensate (Central Plant use over 150 psig)

Gate Valves

Triple Offset Butterfly Valves (Steam And Condensate)

Globe Valves

Piston/Swing Check Valves

Drain Valves

Safety Valves

Steam Pressure Reducing Valves

Oil Systems

Gate Valves

Ball Valves

Check Valves

Spring Loaded Check Valves

Natural Gas Systems

Shut-off Valves

Gas Pressure Regulators

Compressed Air systems

Shut-off Valves

Specialty Valves and Valve Accessories

Gauge Valves

Chain Wheel Operators

Stem Extensions

PART 3 - EXECUTION

General

Shut-off Valves

Balancing Valves

Calibrated Balancing Valves

Drain Valves

Safety Relief Valves

Spring Loaded Check Valves

Swing Check Valves

Combination Shut-off, Check, and Balancing Valves

Pressure Reducing Valves

Gas Pressure Regulators

## RELATED WORK

Section 01 91 01 or 01 91 02 – Commissioning Process

Section 23 05 15 - Piping Specialties

Section 23 09 14 - Pneumatic and Electric Instrumentation and Control Devices for HVAC

## REFERENCE

Applicable provisions of Division 1 govern work under this section.

## QUALITY ASSURANCE

Refer to division 1, General Conditions, Equals and Substitutions.

## SUBMITTALS

Refer to division 1, General Conditions, Submittals.

Contractors shall submit a schedule of all valves indicating type of service, dimensions, materials of construction, and pressure/temperature ratings for all valves to be used on the project. Temperature ratings specified are for continuous operation.

## OPERATION AND MAINTENANCE DATA

All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

Delete the following if there are no additional requirements.

In addition to the general content specified under GENERAL REQUIREMENTS supply the following additional documentation:

1. [A/E and commissioning provider to define detailed operation and maintenance data requirements for equipment specifications added to this section.]

## DESIGN CRITERIA

Where valves are specified for individual mechanical services (i.e. hot water heating, steam, etc.) all valves shall be of the same manufacturer unless prior written approval is obtained from DFD.

# P A R T 2 - P R O D U C T S

## MANUFACTURERS

Anvil, Apollo, Armstrong, Bell & Gossett, Cash-Acme, Dresser Consolidated, Conval, Crane, Anderson Greenwood and Crosby, Danfoss-Flomatic, DeZurik, Durco, Fisher, Grinnell, Griswold, Hammond, Hancock, Hoffman, Jamesbury, Keystone, Kunkle, Leslie, Lunkenheimer/Cincinnati, Metraflex, Milwaukee, Mueller, Newco, Nexus, Nibco, Powell, RP&C, Sarco, Spence, Stockham, Taco, Tasco, Thrush-Amtrol, Vogt, Watts, or approved equal.

## BYPASS VALVES

A bypass globe valve is required on main steam shutoff valves 2 inch and larger on steam pressures greater than 15 psig for supervised warm-up.

## WATER SYSTEM VALVES

All water system valves to be rated at not less than 125 psig water working pressure at 240°F unless noted otherwise.

GATE VALVES:

2" and smaller: Use ball valves; gate valves will not be accepted in sizes 2" and smaller.

2-1/2" and larger: Use butterfly valves; gate valves will not be accepted in sizes 2-1/2" and larger.

BALL VALVES:

2" and smaller: Two piece bronze body; threaded or soldered ends, as appropriate to the pipe material; soild stainless steel ball; [full, conventional] port; glass filled teflon seat; threaded packing gland follower; blowout-proof stem; 600 psig WOG.

Valve stems shall allow operators to clear insulation without interference. Provide stem extensions when valve operators interfere with pipe insulation.

Review need for special stem extension on low temperature systems requiring a vapor barrior on the insulation.

Apollo 70-100/200 series, Hammond 8301/8311, Milwaukee BA100/150, Nibco T/S 585-70, Stockham S206/216.

2-1/2" and over: Ball valves will not be accepted in sizes over 2 inch.

BUTTERFLY VALVES (System - Not Chilled Water Building Entrance Valves):

2" and smaller: Use ball valves; butterfly valves will not be accepted in sizes 2 inch and smaller.

2-1/2" and larger: Cast iron body; stainless steel shaft; Teflon, nylatron, or acetal bearings; EPDM resilient seat. Disk to be bronze, aluminum-bronze, nickel plated ductile iron, cast iron with welded nickel edge, or 316 - stainless steel. Pressure rated to 150 psig. Valve assembly to be bi-directionally bubble tight to 150 psig with no downstream flange/pipe attached. Nylon coated ductile iron discs are not acceptable. Polymid or polyamide coated valves are not acceptable.

Valve stems shall allow operators to clear insulation without interference. Provide stem extensions when valve operators interfere with pipe insulation.

Use threaded lug type valves for installation with class 125/150 flanges.

Centerline series 200, DeZurik BOS-CL, Keystone Fig. 222, Nibco LD2000 (2-1/2”-12”)/LD1000 (14” and above), Bray Series 3L, Victaulic 300 series (2-1/2”-12”)/709 series (14”-24”).

The listed manufacturers provide bidirectional bubble tight shutoff at full rated pressure for dead end service without requiring a flange on the downstream side. Verify that manufacturers added to this list are capable of meeting this requirement.

Verify service pressure for each application. Valves for UW Madison chilled water distribution system shall be rated for 200 psig. The above specification will require editing for this. Note that Centerline series 200, DeZurik BOS-CL, Keystone Fig. 222 and Nibco LD2000 are rated for standard 150 psig or 200 psig depending upon sizes and materials (all can meet 200 psig thru 12”, Nibco thru 14”- (Verify current manufacturer ratings and material types). Bray can meet the 200 psig rating through 20”

Ductile iron discs are not acceptable; with copper piping in the system [now or in the future], electrolysis will destroy the disc.

Provide ten-position lever actuators for valves 6" and smaller. Provide worm gear operators for valves 8" and larger.

Where butterfly valves are indicated or specified to be installed at the location of a flow sensing device, provide the butterfly valves with a memory stop.

BUTTERFLY VALVES (Chilled Water Building Entrance):

Chilled Water Building Entrance Valves are defined as the first set of valves entering a building (Buildings with multiple service entrance pipes may have multiple Building Entrance valves) . These valves are intended to isolate the building from the distribution system.

3” and larger: Lug style, ASME class 150, ASTM 216 GR WCB (Carbon Steel) body that meets API 598 bi-directional bubble tight. Blowout proof stainless steel stem, stainless steel disc. Valve seat shall be resilient, renewable, have the seat retaining ring bolted to valve body. DelTech DelVal Series 45, Jamesbury Wafersphere, Bray Series 40, Xomox Tufline, Keystone K-Lok or Cameron WKM.

Valve stems shall allow operators to clear insulation without interference. Provide stem extensions when valve operators interfere with pipe insulation.

Use threaded lug type valves for installation with class 125/150 flanges.

Provide ten-position lever actuators for valves 6" and smaller. Provide worm gear operators for valves 8" and larger.

Where butterfly valves are indicated or specified to be installed at the location of a flow sensing device, provide the butterfly valves with a memory stop.

GLOBE VALVES:

Do not use globe valves for water service, except in temperature control applications.

SWING CHECK VALVES:

2" and smaller: Class 125, bronze body, threaded or soldered ends, regrindable seat, bronze disc, threaded cap, suitable for installation in a horizontal or vertical line with flow upward.

Crane 137/1342, Hammond IB912/IB940, Lunkenheimer 2144/2145, Milwaukee 509/1509, Nibco T-413-B/S-413-B, Powell 578/1825, Stockham B-309/B-319.

2-1/2" and larger: Class 125, cast iron body, flanged ends, bronze trim, bolted cap, renewable bronze seat and disc, non-asbestos gasket, suitable for installation in a horizontal or vertical line with flow upward.

Crane 373, Hammond IR1124, Lunkenheimer 1790, Milwaukee F2974, Nibco F918, Powell 559, Stockham G-931.

SPRING LOADED CHECK VALVES:

2" and smaller: Class 125, bronze body, threaded, solder or wafer ends, bronze trim, stainless steel spring, teflon seat unless only bronze available.

APCO 300 series, ConBraCo 61 series, Mueller 303BP, Nibco T-480-Y/S-480-Y, Val-Matic 1400 series.

2-1/2" and larger: Class 125, cast iron or semi-steel body, wafer or globe flanged type, bronze trim, bronze or EPDM seat, stainless steel spring, stainless steel stem if stem is required. Valves with ductile iron in contact with the working fluid will not be accepted.

APCO 600 series, Metraflex 900 series, Milwaukee 1800 series, Mueller Steam 101M-AP/105M-AP, Nibco F910 series, Val-Matic 1800 series, Victaulic series 716.

BALANCE VALVES:

2" and smaller: Bronze or copper alloy body with calibrated ball, globe or venturi/valve arrangement, integral pointer and calibrated scale to register degree of valve opening, memory stop, drain tapping, threaded or soldered ends, with or without integral unions, P/T or Shraeder pressure taps with integral check valves and seals, adjustable memory stop, suitable for 200 psig water working pressure at 250°F.

Armstrong CBV, Bell & Gossett Circuit Setter Plus, Griswold Quickset, Nexus Orturi, Nibco 1710 Series, Oventrop MTR/VTR/LFCS, Red White Valve 9517 Series, Taco Accu-Flo, Tour & Anderson STAS/STAD, Victaulic series 786/787.

Include one bellows type differential pressure meter kit that includes a six inch diameter gauge with 270° arc readout and having an accuracy of ±1% of full scale or better and suitable for the differential pressures of the valves supplied for this project, over-range protection, color coded hoses not less than ten feet in length with brass connectors suitable for connection to the low and high pressure connections on the balance valves, instrument valving so meter can be vented and drained, pressure and temperature rating at least equal to that of the valves. Provide meter and all accessories in a durable case with carrying handle.

Barton 247A, Midwest 809.

Meters are typically not required - discuss with DFD engineering personnel if there are questions.

2-1/2" and larger: Use butterfly valves as specified in this section along with a flow sensing device as specified in Section 23 05 15.

DRAIN VALVES:

Use 3/4 inch ball valve with threaded hose adapter except strainer blowdown valves to be the same size as the blowdown connection. Provide hose connection caps pressure rated for 150 psig at 180 deg F.

COMBINATION SHUT-OFF, CHECK, AND BALANCE VALVES:

2 inch and larger: Cast or ductile iron body, threaded or flanged or grooved end connections, stainless steel spring, bronze disc with EPDM seat, calibrated memory stop, backseating valve stem, inlet and outlet pressure tappings, capable of being repacked under full line pressure, and suitable for a minimum working pressure of 175 psig at 240°F when used in hot water heating systems.

Armstrong Flo-Trex, Bell & Gossett Triple Duty, Taco Multi-Purpose Valve, Thrush-Amtrol Tri-Flow.

Verify chilled water system design pressures with DFD engineering personnel. Valves such as B&G's triple duty valve are typically rated at 175 psig/250 deg. F in their catalog, but carry the rating of 200 psig if used at 150 deg. F or less. The higher pressure rating for chilled water may be required to accommodate connections to central chilled water systems, now or in the future.

WATER PRESSURE REDUCING VALVES:

Brass or bronze body, diaphragm operated, with an integral anti-syphon check valve, inlet strainer, adjustable reduced pressure range, and rated for 125 psig at 225 degrees F. Valve to be pre-set for the scheduled pressure.

Bell & Gossett, Cash-Acme, or Watts.

WATER RELIEF VALVES:

Iron or bronze body, direct pressure actuated, teflon seat, stainless steel stem and spring, suitable for 125 psig water working pressure at 240° F and ASME stamped, with Btu capacity and set point as scheduled.

Bell & Gossett, Cash-Acme, Consolidated, Kunkle, Watts.

Relief valves for campus type central piping systems require special construction and sizing criteria. Verify requirements with DFD for the specific project.

SELF-CONTAINED CONTROL VALVES:

Use self-contained control valves only with prior approval of DFD.

Cast bronze or forged brass body, actuator with integral temperature sensor and adjustment-spring balanced bellows, stainless steel spindle riding against an O-ring within the packing gland, O-ring packing gland replaceable while the system is in operation with standard tools and without any need for isolation valves, suitable for 125 psig water working pressure at 240°F. Valves to return to the open position upon failure of temperature control unit.

Bell & Gossett, Danfoss-Flomatic, Taco.

## LOW PRESSURE STEAM/CONDENSATE (Building Service 15 psig or less)

Even though steam pressure in the system may be below 15 psig, valves with a higher rating are need in some instances due to superheat.

GATE VALVES:

2" and smaller: Class 150, bronze body, bronze trim, threaded ends, solid wedge, rising stem, non-asbestos packing, union bonnet, malleable iron hand wheel.

Crane 431UB, Hammond IB629, Milwaukee 1151(M), Nibco T134, Lunkenheimer 3151, Powell 2714, Stockham B120.

2-1/2" and larger: Class 150, ASTM 216, Grade WCB, steel body, O.S. & Y., stainless steel or 12% chrome faced wedge, Stellite seat, flanged, bolted bonnet, non-asbestos packing.

Crane 47XU, Milwaukee 1550, Lunkenheimer 1512, Powell 1503, Stockham 1822.

BUTTERFLY VALVES:

3” and smaller: Use gate valves, butterfly valves are not acceptable in sizes 3” and smaller.

4” and larger: ANSI Class 150, ASTM 216, Grade WCB suitable for continuous duty in saturated steam, cast steel body, stainless steel shaft, stainless steel or nickel plated steel disc, reinforced high temperature polymeric (teflon) resilient seat with full supporting stainless steel ring. Lug or wafer type. Manual worm gear operator with high ratio (18 to 1 minimum).

Valve stems shall allow operators to clear insulation without interference. Provide stem extensions when valve operators interfere with pipe insulation.

Bray Series 40, Jamesbury 815, Flowseal HPBV, Keystone K-Lok, DelTech DelVal Series 45.

GLOBE VALVES:

2" and smaller: Class 150, bronze body, bronze trim, threaded ends, teflon disc, rising stem, non-asbestos packing, union bonnet, malleable iron hand wheel.

Crane 7TF, Hammond IB413T, Milwaukee 590T, Nibco T235, Lunkenheimer LQ600-150, Powell 150, Stockham B-22T.

2-1/2" and larger: Class 125, iron body, bronze trim, non-asbestos packing, bolted bonnet, O.S. & Y., bronze/cast iron disc, flanged.

Crane 351, Hammond IR116, Milwaukee F2981M, Nibco F-718-B, Lunkenheimer 1123 IBBM, Powell 241, Stockham G512.

SWING CHECK VALVES:

Use only where condensate is lifted above trap outlet. Avoid lifting condensate if at all possible.

2" and smaller: Class 125, bronze body, threaded ends, regrindable seat, bronze disc, threaded cap, suitable for installation in a horizontal or vertical line with flow upward.

Crane 137, Hammond IB940, Milwaukee 509, Nibco T-413-B, Lunkenheimer 2144, Powell 578, Stockham B-319.

2-1/2" and larger: Class 125, cast iron body, flanged ends, bronze trim, bolted cap, renewable bronze seat and disc, non-asbestos gasket, suitable for installation in a horizontal or vertical line with flow upward.

Crane 373, Hammond IR1124, Lunkenheimer 1790, Milwaukee F2974, Nibco F918, Powell 559, Stockham G-931.

SPRING LOADED CHECK VALVES:

2" and smaller: Class 125, bronze body, threaded or wafer ends, bronze trim, stainless steel spring, teflon seat unless only bronze available.

APCO 300 series, ConBraCo 61 series, Mueller 303BP, Nibco T-480-Y, Val-Matic 1400 series.

2-1/2" and larger: Class 125, cast iron or semi-steel body, wafer or globe flanged type, bronze trim, bronze or EPDM seat, stainless steel spring, stainless steel stem if stem is required. Valves with ductile iron in contact with the working fluid will not be accepted.

APCO 600 series, Metraflex 900 series, Milwaukee 1800 series, Mueller Steam 101M-AP/105M-AP, Nibco F910 series, Val-Matic 1800 series.

DRAIN VALVES:

Use 3/4 inch, class 150 gate valve as specified for steam and condensate systems with threaded hose adapter. Strainer blowdown valves to be the same size at the blowdown connection. Provide hose connection caps pressure rated for 150 psig at 180 deg F.

SAFETY VALVES:

Valve capacities to be as scheduled, based on saturated steam in pounds per hour, 90% basis, 10% accumulation in accordance with ASME codes. Provide a drip pan elbow for each discharge pipe vertical rise from horizontal for each valve.

2" and smaller: Bronze body, threaded ends, brass trim, stainless steel spring, ASME stamped, with test lever, suitable for 250 psig steam at 406°F.

Kunkle Series 6000, Consolidated 1541, Lonergan Model A Series, Sarco Series 6010.

2 1/2" and larger: Cast iron body, flanged ends, bronze trim, stainless steel spring, ASME stamped, with test lever, suitable for 250 psig steam at 406°F.

Kunkle Model 252, Consolidated 1511, Lonergan Y Series, Sarco SVI.

STEAM PRESSURE REDUCING VALVES:

This specification can be modified to an air loaded type valve if the reducing valve is to be installed in a high or inaccessible location or if the application has a need for varying the steam pressure. If this type of control valve is used, make sure that the temperature control specification includes provision of a pneumatic line for the air loader.

Cast iron body, stainless steel trim, pilot actuated, diaphragm operated, threaded ends for 2" and smaller and ANSI 250 flanged ends for 2-1/2" and larger, stainless steel noise attenuating trim for all valve sizes 2" and larger, suitable for 250 psig steam at 450°F. Main valve seat and plug to be replaceable.

Leslie GPS-1EP, Fisher 92C, Hoffman Series 2000, Sarco 25P, or Spence Type E.

Use spring loaded pilots with stainless steel seats and mounted on the main valve.

## HIGH PRESSURE STEAM/CONDENSATE (Building Service over 15 psig)

GATE VALVES:

2" and smaller: Class 200, bronze body, bronze trim, threaded ends, solid wedge, stainless steel seat rings, rising stem, non-asbestos packing, union bonnet, malleable iron hand wheel.

Crane 424, Hammond IB651, Milwaukee 1174, Nibco T-174-SS, Lunkenheimer 2227, Powell 2375, Stockham B132.

For pressures over 100 psig in steam pits and in steam tunnels, specify a forged steel, class 800 valve for sizes 2” and smaller. Reference the specifications for high pressure steam over 150 psig below.

2-1/2" and larger: Class 150, ASTM 216, Grade WCB, steel body, O.S. & Y., stainless steel or 12% chrome faced wedge, Stellite seat, flanged, bolted bonnet, non-asbestos packing.

Crane 47XU, Milwaukee 1550, Lunkenheimer 1512, Powell 1503, Stockham 1822.

BUTTERFLY VALVES:

3” and smaller: Use gate valves, butterfly valves are not acceptable in sizes 3” and smaller.

4” and larger: ANSI Class 150, ASTM 216, Grade WCB suitable for continuous duty in saturated steam, cast steel body, stainless steel shaft, stainless steel or nickel plated steel disc, reinforced high temperature polymeric (teflon) resilient seat with full supporting stainless steel ring. Lug or wafer type. Manual worm gear operator with high ratio (18 to 1 minimum).

Valve stems shall allow operators to clear insulation without interference. Provide stem extensions when valve operators interfere with pipe insulation.

Bray Series 40, Jamesbury 815, DelTech DelVal Series 45, Flowseal HPBV, Keystone K-Lok.

GLOBE VALVES:

Use only where throttling is required, such as the bypass for steam pressure reducing stations..

2" and smaller: Class 200, bronze body, stainless steel plug disc and seat rings, non-asbestos packing, threaded ends, rising stem, union bonnet, malleable iron hand wheel.

Crane 212P, Hammond IB434, Milwaukee 592A, Nibco T-276-AP, Lunkenheimer 73-PS, Powell 2608, Stockham B-62.

For pressures over 100 psig in steam pits and in steam tunnels, specify a forged steel, class 800 valve for sizes 2” and smaller. Reference the specifications for high pressure steam over 150 psig below.

2-1/2" and larger: Class 150, ASTM 216, Grade WCB, steel body, O.S. & Y., stainless steel or 12% chrome faced disc, Stellite seat rings, flanged, bolted bonnet, non-asbestos packing.

Crane 143XU, Milwaukee 1560, Lunkenheimer 1542W, Powell 1531, Stockham 1812.

Temperature control throttling globe valves will be provided by the temperature control contractor.

SWING CHECK VALVES:

Use only where condensate is lifted above trap outlet. Avoid lifting condensate if at all possible.

2" and smaller: Class 200, bronze body, threaded ends, renewable nickel-alloy or bronze seats and discs, 45 degree seating angle, threaded cap.

Crane 36, Hammond IB944, Lunkenheimer 554Y, Milwaukee 508, Nibco T473B, Powell 560, Stockham B345.

2-1/2" and larger: Class 150, ASTM 216, Grade WCB, steel body, renewable stainless steel seats and discs, 45 degree seating angle, bolted cap, non-asbestos gasket.

Crane 147XU, Lunkenheimer 1572W, Milwaukee 1570, Powell 1561, Stockham 1842.

DRAIN VALVES:

Use 3/4 inch, class 200 gate valve with threaded hose adapter except strainer blowdown valves to be the same size at the blowdown connection.

SAFETY VALVES:

Valve capacities to be as scheduled, based on saturated steam in pounds per hour, 90% basis, 10% accumulation in accordance with ASME codes. Provide a drip pan elbow for each discharge pipe vertical rise from horizontal for each valve.

2" and smaller: Bronze body, threaded ends, brass trim, stainless steel spring, ASME stamped, with test lever, suitable for 250 psig steam at 406°F.

Kunkle Series 6000, Consolidated 1541, Lonergan Model A Series, Sarco Series 6010.

2 1/2" and larger: Cast iron body, flanged ends, bronze trim, stainless steel spring, ASME stamped, with test lever, suitable for 250 psig steam at 406°F.

Kunkle Model 252, Consolidated 1511, LonerganY Series, Sarco SVI.

STEAM PRESSURE REDUCING VALVES:

This specification can be modified to an air loaded type valve if the reducing valve is to be installed in a high or inaccessible location or if the application has a need for varying the steam pressure. If this type of control valve is used, make sure that the temperature control specification includes provision of a pneumatic line for the air loader.

Cast iron body, stainless steel trim, pilot actuated, diaphragm operated, threaded ends for 2" and smaller and ANSI 250 flanged ends for 2-1/2" and larger, stainless steel noise attenuating trim for all valve sizes 2" and larger, suitable for 250 psig steam at 450°F. Main valve seat and plug to be replaceable.

Leslie GPK, Fisher 92C, Hoffman Series 2000, Sarco 25P, or Spence Type E.

Use spring loaded pilots with stainless steel seats and mounted on the main valve.

## LOW PRESSURE STEAM/CONDENSATE (Distribution 15 psig or less)

GATE VALVES:

2" and smaller: Class 800, API 602, A105 forged steel body, stainless steel wedge and trim, malleable iron hand wheel, bolted bonnet, bolted gland, O. S. & Y, full port, threaded or socket welded ends.

Bonny Forge, RP&C FO-56/57, Newco 18S/T FS2FP, Vogt 13111/SW13111.

BALL VALVES (STEAM AND CONDENSATE)

2-1/2" Thru 5”: Class 150. Standard port ASTM 216 GR WCB (carbon Steel) body with blowout proof stem, 316SS ball and trim. MPTFE or TFM seats rated to 500°F. Meets ASTM B16.5, B16.10, B16.34. API 608, 598 and 607. Flanged or Socket Weld ends.

Velan TE-150, Jamesbury 7150, Gestra GBV.

DOUBLE OFFSET BUTTERFLY VALVES:

6” and larger: Lug style, ASME class 150, ASTM 216 GR WCB (Carbon Steel) body that meets API 598 bi-directional bubble tight. Blowout proof stainless steel stem, stainless steel disc. Valve seat shall be resilient, renewable, have the seat retaining ring bolted to valve body and be rated for 500°F at 175 PSIG. DelTech DelVal Series 45, Xomox Tufline, Jamesbury Wafersphere or Cameron WKM.

## HIGH PRESSURE STEAM/CONDENSATE (Distribution over 15 psig)

GATE VALVES (STEAM AND CONDENSATE):

2" and smaller: Class 800, API 602, A105 forged steel body, stainless steel wedge and trim, malleable iron hand wheel, bolted bonnet, bolted gland, O. S. & Y, full port, threaded or socket welded ends.

Bonny Forge, RP&C FO-56/57, Newco 18S/T FS2FP, Vogt 13111/SW13111.

BALL VALVES (STEAM AND CONDENSATE)

2-1/2" Thru 5”: Class 150. Standard port ASTM 216 GR WCB (carbon Steel) body with blowout proof stem, 316SS ball and trim. MPTFE or TFM seats rated to 500°F. Meets ASTM B16.5, B16.10, B16.34. API 608, 598 and 607. Flanged or Socket Weld ends.

Velan TE-150, Jamesbury 7150, Gestra GBV.

TRIPLE OFFSET BUTTERFLY VALVES (STEAM):

6” and larger: Lug body, ASME class 150, carbon steel body that meets API 598 bi-directional zero leakage and ASME B16.34. Provide bidirectional zero leakage testing certificates (working pressure on both sides). Valve shall have a self-locking gear operator, blowout proof stainless steel stem, graphite packing and be inherently fire safe. Valves shall have floating disc with static metal laminated seat. Graphite and metal composite seats are not acceptable. Flexing, deforming, friction fit, interference fit, or annular compression ring seats are not acceptable. Quadax, Zwick TriCon, or Adams HTK.

For UW Madison Campus use the Class 300 valves due to elevated system temperatures.

DOUBLE OFFSET BUTTERFLY VALVES (CONDENSATE):

6” and larger: Lug style, ASME class 150, ASTM 216 GR WCB (Carbon Steel) body that meets API 598 bi-directional bubble tight. Blowout proof stainless steel stem, stainless steel disc. Valve seat shall be resilient, renewable, have the seat retaining ring bolted to valve body and be rated for 500°F at 175 PSIG. DelTech Series 45, Jamesbury Wafersphere, DelTech DelVal Series 45, Xomox Tufline, or Cameron WKM.GLOBE VALVES:

Use only where throttling is required, such as the bypass for steam pressure reducing stations.

2" and smaller: Class 800, API 602, A105 forged steel body, stainless steel disc and trim, malleable iron hand wheel, bolted bonnet, bolted gland, O. S. & Y, full port, threaded or socket welded ends.

Anvil 830, RP&C F-80/81, Newco 28S/T FS2, Vogt 12141/SW12141.

2-1/2" and larger: Class 300, ASTM 216, Grade WCB, steel body, O.S. & Y., stainless steel disc and seat, flanged ends, bolted bonnet.

Crane 151XU, Lunkenheimer 3042W, Milwaukee 3060, Powell 3031, Stockham 3812.

Temperature control throttling globe valves will be provided by the temperature control contractor.

PISTON/SWING CHECK VALVES:

Use only where condensate is lifted above trap outlet. Avoid lifting condensate if at all possible.

3" and smaller: 750 CWP, stainless steel body, stainless steel piston disc and trim, 750-X Inconel spring, non-asbestos gasket, threaded or socket welded ends, non-slam, lapped disk and seat

DFT SCV, Check All U1 or approved equal.

4" and larger: Class 300, ASTM 216, Grade WCB, steel body, flanged ends, renewable stainless steel seats and discs, 45 degree seating angle, bolted cap, non-asbestos gasket.

Crane 159XU, Lunkenheimer 3072W, Milwaukee 3070, Powell 3061, Stockham 3842.

DRAIN VALVES:

Use 3/4 inch, class 800 gate valve with threaded hose adapter except strainer blowdown valves to be the same size at the blowdown connection. Provide hose connection caps pressure rated for 150 psig at 180 deg F.

SAFETY VALVES:

Valve capacities to be as scheduled, based on saturated steam in pounds per hour, 90% basis, 10% accumulation in accordance with ASME codes. Provide a drip pan elbow for each discharge pipe vertical rise from horizontal for each valve.

Kunkle, Consolidated, or Crosby.

2" and smaller: Cast steel body, threaded ends, stainless steel trim, stainless steel spring, ASME stamped, with test lever, suitable for 650 psig steam at 800°F.

Crosby JMB, Kunkle 900 Series, Lonergan Model A Series, Sarco Model 900.

2 1/2" and larger: Cast steel body, ANSI 600 psig flanged inlet and 150 psig outlet, stainless steel trim, stainless steel spring, ASME stamped, with test lever, suitable for 650 psig steam at 800°F.

Crosby HS, Kunkle Model 600 Series, Lonergan Model K50, Consolidated 1811, Sarco Model 600.

STEAM PRESSURE REDUCING VALVES:

Cast steel body, stainless steel trim, pilot actuated, diaphragm operated, threaded ends for 2" and smaller and 300 psig flanged ends for 2-1/2" and larger, stainless steel noise attenuating trim for all valves exceeding 90 dBA, suitable for 300 psig steam at 500°F. Main valve seat and plug to be replaceable.

Leslie GPS-1, Fischer 92S, Sarco 25P, or Spence Type E. Submit sound data.

Use spring loaded pilots with stainless steel seats and mounted on the main valve.

## HIGH PRESSURE STEAM/CONDENSATE (Central Plant use over 150 psig)

GATE VALVES:

2" and smaller: Class 800, API 602, A105 forged steel body, stainless steel wedge and trim, malleable iron hand wheel, bolted bonnet, bolted gland, O. S. & Y, full port, threaded or socket welded ends.

Bonny Forge, RP&C FO-56/57, Newco 18S/T FS2FP, Vogt 13111/SW13111.

2-1/2": Class 600, ASTM 216, Grade WCB, steel body, O.S. & Y., stainless steel wedge, steel seat, flanged ends, bolted bonnet.

Crane 76XU, Lunkenheimer 6012, Milwaukee 6050, Powell 6003, Stockham 3822.

BALL VALVES (STEAM AND CONDENSATE)

2-1/2" Thru 5”: Class 150. Standard port ASTM 216 GR WCB (carbon Steel) body with blowout proof stem, 316SS ball and trim. MPTFE or TFM seats rated to 500°F. Meets ASTM B16.5, B16.10, B16.34. API 608, 598 and 607. Flanged or Socket Weld ends.

Velan TE-150, Jamesbury 7150, Gestra GBV.

TRIPLE OFFSET BUTTERFLY VALVES (STEAM and CONDENSATE):

6” and larger: Lug body, ASME class 600, carbon steel body that meets API 598 bi-directional zero leakage and ASME B16.34. Valve shall have a self-locking gear operator, blowout proof stainless steel stem, graphite packing and be inherently fire safe. Valves shall have floating disc with static metal laminated seat. Graphite and metal composite seats are not acceptable. Flexing, deforming, friction fit, interference fit, or annular compression ring seats are not acceptable. Quadax, Zwick TriCon or Adams HTK.

Vanessa valves are not approved for central plant use (over 150 PSIG) due to significant valve shutoff failures.

GLOBE VALVES:

Use only where throttling is required, such as the bypass for steam pressure reducing stations.

2" and smaller: Class 800, API 602, A105 forged steel body, stainless steel disc and trim, malleable iron hand wheel, bolted bonnet, bolted gland, O. S. & Y, full port, threaded or socket welded ends.

Anvil 830, RP&C F-80/81, Newco 28S/T FS2, Vogt 12141/SW12141.

2-1/2" and larger: Class 600, ASTM 216, Grade WCB, steel body, O.S. & Y., stainless steel disc and seat, flanged ends, bolted bonnet.

Crane 171XU, Lunkenheimer 6042W, Milwaukee 6060, Powell 6031, Stockham 6812.

Temperature control throttling globe valves will be provided by the temperature control contractor.

PISTON/SWING CHECK VALVES:

Use only where condensate is lifted above trap outlet. Avoid lifting condensate if at all possible.

2" and smaller: Class 800, API 602, A105 forged steel body, stainless steel piston disc and trim, bolted cap, non-asbestos gasket, threaded or socket welded ends.

Anvil 841, RP&C F-90/91, Newco 48S/T FS2, Vogt 701/701SW.

2-1/2" and larger: Class 600, ASTM 216, Grade WCB, steel body, flanged ends, renewable stainless steel seats and discs, 45 degree seating angle, bolted cap, non-asbestos gasket.

Crane 175XU, Lunkenheimer 6072W, Milwaukee 6070, Powell 6061, Stockham 6842.

DRAIN VALVES:

Use 3/4 inch, class 800 gate valve with threaded hose adapter except strainer blowdown valves to be the same size at the blowdown connection. Provide hose connection caps pressure rated for 150 psig at 180 deg F.

SAFETY VALVES:

Valve capacities to be as scheduled, based on saturated steam in pounds per hour, 90% basis, 10% accumulation in accordance with ASME codes. Provide a drip pan elbow for each discharge pipe vertical rise from horizontal for each valve.

2" and smaller: Cast steel body, threaded ends, stainless steel trim, stainless steel spring, ASME stamped, with test lever, suitable for 650 psig steam at 800°F.

Crosby JMB, Kunkle 900 Series, Lonergan Model A Series, Sarco Model 900.

2 1/2" and larger: Cast steel body, ANSI 600 psig flanged inlet and 150 psig outlet, stainless steel trim, stainless steel spring, ASME stamped, with test lever, suitable for 650 psig steam at 800°F.

Crosby HS, Kunkle Model 600 Series, Lonergan Model K50, Consolidated 1811, Sarco Model 600.

STEAM PRESSURE REDUCING VALVES:

Cast steel body, stainless steel trim, pilot actuated, diaphragm operated, threaded ends for 2" and smaller and 600 psig flanged ends for 2-1/2" and larger, stainless steel noise attenuating trim for all valves exceeding 90 dBA, suitable for 600 psig steam at 750°F. Main valve seat and plug to be replaceable.

Leslie GPHS-1 or Spence Type E. Submit sound data.

Use spring loaded pilots with stainless steel seats and mounted on the main valve.

## OIL SYSTEMS

The following specifications for oil valves have been changed so they are in agreement with NFPA 30 3-3. While brass/bronze valves may be allowable by NFPA if certain criteria are followed, DFD plans to allow only ductile iron or steel valves.

GATE VALVES:

2" and smaller: Forged steel, threaded ends, stainless steel trim, O.S. & Y., solid wedge, rising stem, bolted bonnet, 2000 psi W.O.G.

Vogt 12111 series, Hancock 950 series, Tasco.

2-1/2" and larger: Ductile iron body, stainless steel trim, O.S. & Y., solid wedge, flanged ends, 250 psi W.O.G.

Stockham D-623-12, Nibco F637-33.

BALL VALVES:

2" and smaller: Steel body; threaded; stainless steel or chrome plated steel ball; conventional port; glass filled teflon seat; blowout-proof stem; one-piece body; threaded packing gland follower; suitable for 2000 psig working pressure, American Petroleum Institute approved. Provide valve neck extensions for valves installed in insulated pipe.

Apollo 93 series, Milwaukee BA170 series, Nibco T-560-CS-R-25.

2-1/2" and over: Ball valves will not be accepted in sizes over 2 inch.

CHECK VALVES:

2" and smaller: Steel body, globe pattern, threaded ends, renewable seat, renewable disc, 300 psi W.O.G.

Hancock 5370S, Tasco, Vogt 2791 series.

2-1/2" and larger: Ductile iron or steel body, stainless steel trim, flanged ends, bolted bonnet, non-asbestos gasket/packing, 200 psi W.O.G.

Nibco F938-33, Vogt 573.

SPRING LOADED CHECK VALVES:

2" and smaller: Steel or stainless steel body, threaded ends, stainless steel spring and trim, replaceable disk, non-asbestos gasket, 250 psi W.O.G.

Mueller 203-HT.

2-1/2" and larger: Steel body, wafer style, stainless steel seat and disc, stainless steel spring, 200 psi at 100°F.

Mueller 101M-DT.

## NATURAL GAS SYSTEMS

SHUT OFF VALVES:

2" and smaller: Ball valve, bronze body, threaded ends, chrome-plated bronze or stainless steel ball, full or conventional port, teflon seat, blowout-proof stem, two-piece construction, suitable for 150 psig working pressure, U.L. listed for use as natural gas shut-off.

2-1/2" through 4": Cast iron body, flanged ends, bronze bearings, electroless nickel plated cast iron plug with Hycar resilient plug seal, Buna-N stem seal packing, lever actuator, 175 psi W.O.G., U.L. listed for use as natural gas shut-off.

5" and larger: Cast iron body, flanged ends, stainless steel bearings, resilient faced plugs, totally enclosed hand wheel actuators, 175 psi W.O.G., U.L. listed for use as natural gas shut-off.

DeZurik, Homestead, Rockwell, Walworth.

GAS PRESSURE REGULATORS:

2" and smaller: Cast iron body, aluminum spring and diaphragm, Nitrile diaphragm, threaded ends, 150 psi W.O.G., -20°F to 150°F.

**COMPRESSED AIR VALVE**

Shut-off valves:

3" and smaller:  Two piece bronze body; threaded ends, chrome plated bronze ball; glass filled teflon seat; teflon packing and threaded packing nut; blowout-proof stem; 600 psig WOG.  Apollo 70-100, Milwaukee BA100, Nibco T585-70 or T-590-Y, Watts B-6000.

3” and larger:  Lug style, ASME class 150, ASTM 216 GR WCB (Carbon Steel) body that meets API 598 bi-directional bubble tight. Blowout proof stainless steel stem, stainless steel disc.  Valve seat shall be resilient, renewable, have the seat retaining ring bolted to valve body.   Deltech Series 45, Jamesbury Wafersphere or Cameron WKM.

## SPECIALTY VALVES AND VALVE ACCESSORIES

GAUGE VALVES:

Water Service: Use 1/4" ball valves.

Steam Service: Use 1/4" gate valves suitable for system operating pressure.

CHAIN WHEEL OPERATORS:

Construct of cast or ductile iron, with adjustable sprocket rims and chain guides. Use galvanized or brass chain and chain closure links to form a continuous loop of chain at each operator.

STEM EXTENSIONS:

Provide stem extensions when valve operators interfere with pipe insulation.

# P A R T 3 - E X E C U T I O N

## GENERAL

***Indicate the locations of all air handling unit isolation valves and control valves on the drawings.  Locate air handling unit isolation valves and control valves as close as possible to air handling units and in accessible locations.  Do not locate above the footprint of the air handling units, ductwork and other piping systems.  Valves must be able to be accessed by a standard 7’-0” step ladder.***

Properly align piping before installation of valves in an upright position; operators installed below the valves will not be accepted.

Install valves in strict accordance with valve manufacturer's installation recommendations. Do not support weight of piping system on valve ends.

Install all temperature control valves.

Install all valves with the stem in the upright position. Valves may be installed with the stem in the horizontal position only where space limitations do not allow installation in an upright position or where large valves are provided with chain wheel operators. Where valves 2-1/2" and larger are located more than 12'-0" above mechanical room floors, install valve with stem in the horizontal position and provide a chain wheel operator. Valves installed with the stems down, will not be accepted.

Install stem extensions when shipped loose from valve.

Prior to flushing of piping systems, place all valves in the full-open position.

**BUILDING ISOLATION VALVES:**

Steam and Condensate Distribution pipe shall extend into the building no more than 5 feet and shall terminate with a building isolation valve (Distribution over 15 psig). Building piping shall extend from the down stream flange of the building isolation valve.

Discuss the locations of the building isolation valves and demarcation point between distribution piping over 15 psig and building service piping with the DFDM mechanical reviewer prior to preliminary review.

## SHUT-OFF VALVES:

Install shut-off valves at all equipment, at each branch take-off from mains, and at each automatic valve for isolation or repair.

WATER SYSTEM:

Butterfly valves installed at the location of a flow sensing device are to have a memory stop.

HIGH PRESSURE STEAM/CONDENSATE (over 15 psig )

Install pressure equalization/warm up bypass line with two gate valves around main steam shut-off valve(s) 2” and larger. Provide bypass valve as specified in Part 2 above to meet requirements of operating pressure and temperature of high pressure steam line. Provide bypasses sizes according to the following table:

|  |  |
| --- | --- |
| **Valve Size** | **Bypass Valve Size** |
| 2” thru 8” | 3/4” |
| 10” | 1” |
| 12” | 1” |
| 14” | 1-1/4” |
| 16” | 1-1/4” |

Bypass lines shall be made with weldolet taps at the top centerline of the steam main line on each side of the shut-off valve and with the line completely above the elevation of the top of the main steam shut-off valve. Bypass line piping shall be ASTM Type S extra strong (schedule 80) black steel pipe with ASTM A126/ANSI B16.4 Class 250 extra heavy cast iron threaded fittings. Union in bypass line to be 3000 pound W.O.G. forged steel ground joint union.

## BALANCING VALVES

Provide balancing valves for all major equipment and at each major branch takeoff and at the discharge of each pump as indicated on drawings and details.

Note that balance valves are no longer necessary on hot water reheat terminal units with two way valve control. Drawings must show location of balance valves on major branch takeoffs (each floor, wing, etc.).

## CALIBRATED BALANCE VALVES

Install where indicated on the drawings and details for balancing of hydronic systems. Retain the shipping container for use as removable insulation.

Delete the last sentence if the project involves a return air plenum and coordinate with the insulation specification unless it can be verified that the shipping containers are made of a material that has flame spread and smoke developed ratings compatible with return air plenums.

## DRAIN VALVES

Provide drain valves for complete drainage of all systems. Locations of drain valves include low points of piping systems, equipment locations specified or detailed including reheat coils, other locations required for drainage of systems.

## SAFETY RELIEF VALVES

Setpoint for steam safety relief valves should be 5 psig over the operating pressure or 10% above the operating pressure, whichever is greater.

Setpoint for water relief valves is indicated on the drawings.

Use air pressure to clean piping prior to installation of safety relief valves.

Install relief valves in locations indicated on drawings, downstream of all pressure reducing valves, and on all boilers.

Install valves in the vertical position, with drain holes, including those from dip pan elbows, piped to the nearest drain.

Inlet and outlet piping connecting to valves must be the same size as valve connections or larger.

Vent steam safety valves to a location outside of building, in the most direct manner possible. Install drip pan elbow as detailed at first vertical rise of the vent pipe. Keep pipe between safety valve and drip pan elbow as short and straight as possible.

Support piping and drip pan elbow independently to prevent stress at connections to safety valves. Install vent pipe so that its weight does not rest on the drip pan elbow. Extend drain line from drip pan elbow and relief valve to nearest drain.

Pipe discharge from water system relief valves to nearest drain.

## SPRING LOADED CHECK VALVES

Install a spring loaded check valve in each pump discharge line where two pumps operate in parallel and no combination shutoff, check and balancing valve is being used.

## SWING CHECK VALVES

Provide swing check valves where specified, detailed, and at steam condensate lines where they rise at outlet of traps. In such cases, provide isolation valves to allow repair or replacement of check valve.

## COMBINATION SHUT-OFF, CHECK, AND BALANCING VALVES

Contractor may use combination shut-off, check and balancing valves where separate shut-off valve, check valve, and balancing valve are specified or detailed in pump discharge piping.

## PRESSURE REDUCING VALVES

Provide gate valve and strainer at inlet. Provide gate valve at outlet.

Install pressure gauges to indicate inlet and outlet pressure at each pressure reducing valve in accordance with Section 23 05 15 - Piping Specialties.

Use eccentric reducers at inlet and outlet of reducing valves where connections are not the same size as adjacent piping.

## GAS PRESSURE REGULATORS

When the gas pressure regulator is equipped with a vent connection, run a connection size vent to outside air in accordance with codes. Use a larger size vent when required by the manufacturer's installation instructions.

END OF SECTION