**SECTION 22 05 23**

**GENERAL DUTY VALVES FOR PLUMBING PIPING**

**BASED ON DFD MASTER SPECIFICATION DATED 01/31/2024**

***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.***

**PART 1 - GENERAL**

**SCOPE**

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

PART 1 - GENERAL

 Scope

 Related Work

 Reference

 Lead Free Requirements

 Quality Assurance

 Submittals

 Operation and Maintenance Data

 Design Criteria

PART 2 - PRODUCTS

 Water System Valves

 Ball Valves

 Butterfly Valves

 Swing Check Valves

 Spring Loaded Check Valves

 Balance Valves

 Drain Valves

 Buried Water Service Valves

 Corporation Stop Valves

 Curb Stop Valves

 Swim Pool and Fish Hatchery/Aquarium Water Valves

 Ball Valves

 Check Valves

 Pure Water Valves

 Diaphragm Valves

 Check Valves

 Waste System Valves

 Gate Valves

 Ball Valves

 Swing Check Valves

 Spring Loaded Check Valves

 Natural Gas Systems

 Shut-off Valves

 Exterior Below Grade Shutoff Valves

 Gas Pressure Regulators

 Compressed Air Systems

 Shut-off Valves

 Safety Exhaust Shut-off Valves

 Pressure Reducing Valves

 Specialty Valves and Valve Accessories

 Gauge Valves

 Water Pressure Reducing Valves

 Safety Relief Valves

 Sewer Air and Vacuum Valves

PART 3 - EXECUTION

 General

 Shut-off Valves

 Balancing Valves

 Drain Valves

 Spring Loaded Check Valves

 Swing Check Valves

 Pressure Reducing Valves

 Safety Relief Valves

 Gas Pressure Regulators

 Compressed Air Valves

 Sewer Air and Vacuum Valves

**RELATED WORK**

Section 01 91 01 or 01 91 02 – Commissioning Process

Section 22 05 00 Common Work Results for Plumbing

Section 22 05 14 - Plumbing Specialties

Section 22 30 00 - Plumbing Equipment

**REFERENCE**

Applicable provisions of Division 1 govern work under this section.

**LEAD FREE REQUIREMENTS**

All materials that contact potable water shall be lead free. Lead free refers to the wetted surface of pipe, fittings and fixtures in potable water systems that have a weighted average lead content ≤0.25% per the Federal Safe Drinking Water Act as amended January 4th 2011 Section1417.

**QUALITY ASSURANCE**

Substitution of Materials: Refer to Section GC - General Conditions of the Contract, Equals and Substitutions.

**SUBMITTALS**

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**

ANSI Z21.22 - Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems.

ASSE 1003 - Water Pressure Reducing Valves for Domestic Water Supply Systems.

Where valve types (ball, butterfly, etc.) are specified for individual plumbing services (i.e. domestic water, gas, etc.), each valve type shall be of the same manufacturer unless prior written approval is obtained from the Owner.

Valves to be line size unless specifically noted otherwise.

**PART 2 - PRODUCTS**

**WATER SYSTEM VALVES**

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

Ball valves:

3" and smaller: Two piece bronze body; sweat, threaded or ASTM F1960 joint connection ends, full port stainless steel ball and stem; glass filled teflon seat; teflon packing and threaded packing nut; blowout-proof stem; 600 psig WOG. Provide valve stem extensions for valves installed in all piping with insulation. Nibco 585-70-66 LF or equal by Apollo, Milwaukee, Watts.

Butterfly valves:

2-1/2" and larger: Cast or ductile iron body; stainless steel shaft; bronze, copper or teflon bushings; EPDM resilient seat; EPDM seals; EPDM encapsulated ductile iron or stainless steel disc. 200 psig WOG through 12. Valve assembly to be bubble tight to 175 psig with no downstream flange/pipe attached. Use tapped lug type valves with stud bolts or cap screws, or grooved end connection valves, permitting removal of downstream piping while using the valve for system shutoff. Nibco LD-2022 or GD-4765, or equal by Milwaukee, Victaulic or Watts.

Provide 10 position locking lever handle actuators for valves 6" and smaller. Provide worm gear operators with external position indication for valves 8" and larger.

***Specify valve stem and neck extensions for butterfly valves when used in low temperature service (chilled potable water, etc.) subject to condensation buildup where handles do not clear insulation.***

Swing check valves:

3" and smaller: Bronze body, sweat or threaded ends, Y-pattern, regrindable bronze seat, renewable bronze disc, Class 125, suitable for installation in a horizontal or vertical line with flow upward. Hammond UP904, Milwaukee UP509, Nibco S413-Y-LF, Watts LFCV, Apollo equal.

4" and larger: Cast iron body, flanged ends, bronze trim, bolted cap, renewable bronze seat and disc, Class 125, non-asbestos gasket, suitable for installation in a horizontal or vertical line with flow upward. Hammond IR 1124, Milwaukee F2974, Nibco F918B, Watts Series 411, Apollo equal.

Spring loaded check valves:

2" and smaller: Bronze body, sweat or threaded ends, bronze trim, stainless steel spring, stainless steel center guide pin, Class 125, teflon seat unless only bronze available. ConBraCo 61 series, Nibco S480-Y-LF, Watts LF600 or equal.

2-1/2" and larger: Cast or ductile iron body, wafer or globe type, bronze trim, bronze or EPDM seat, stainless steel spring, stainless steel stem if stem is required, Class 125. Hammond IR9253 or IR9354, Milwaukee 1400 or 1800 series, Nibco W910-LF or F910-LF.

Balance valves:

2" and smaller: Brass body, 304 stainless steel ball, sweat or threaded ends, glass filled teflon seat, brass readout valves with EPT checks, with adjustable memory stop position indicator and extended handle stem, suitable for 300 psig water working pressure at 200 degrees F. B&G Xylem Circuit Setter Plus CB1SLF/CB-1LF, or equal by Nibco, Red and White Valve or Watts.

Drain valves:

3/4 inch ball valve with integral threaded hose adapter, sweat or threaded inlet connections, with threaded cap and chain on hose threads, Apollo 70LF-200-HC, Milwaukee BA-100H or BA-150H Hammond 8501H or 8511H or equal by Nibco, or Watts.

Buried Water Service Gate valves:

Cast iron body, resilient elastomer coated cast iron disc, permanently lubricated stuffing box, bronze non-rising stem and stem nut, double O-ring stem seal, Delrin thrust bearings, electroplated nuts and bolts, cast iron operating nut, AWWA C509, rated for 200 psi. Coat valve inside and out with fusion bonded epoxy, AWWA C550. Clow F-6100, Kennedy 1571, Mueller A-2360, Waterous 500, Watts 406RW.

UNDERGROUND WATER SERVICE BUTTERFLY VALVES:

Rubber-seated butterfly valve meeting the requirements of AWWA C504, for Class 150B. Body and disc shall be constructed of cast iron. Disc shall be lens shaped.

Interior and exterior surfaces of valve shall be provided with epoxy coating meeting the requirements of AWWA C550. Disc shall be provided with a stainless steel disc edge.

Valve stem shall be stainless steel. Packing shall be permanent duty “chevron V-type” or “O-ring” type. Bearings shall be permanent, non-metallic, and self-lubricating.

Valve seat shall be a single piece of elastomeric material that is not penetrated by the valve shaft.

Provide manual operator that is suitable for underground service and includes a standard 2” square operating nut.

Valve shall be provided with mechanical joint connections.

Mueller, Clow, Henry Pratt, or approved equal.

Corporation Stop valves:

2" and smaller: Bronze body ground key valve, bronze plug, AWWA taper thread inlet and copper flare outlet nut connections or compression type, AWWA C800.

Curb Stop valves:

2" and smaller: Bronze body plug valve, bronze plug, quarter turn check, O-ring seals, copper flare nut connections or compression type, AWWA C800.

**valve boxes**

GATE/BUTTERFLY VALVE BOXES:

Valve boxes shall be 5 1/4”, cast iron valve boxes. Boxes shall be threaded, three-piece design with stay-put “WATER” cover. Provide appropriately sized bonnet.

Provide valve box extensions as necessary to accommodate depth of cover shown on plans, or 6.5’ minimum.

Valve boxes shall be Tyler, or approved equal.

**CURB STOP BOXES:**

Curb stop boxes shall be 1 1/4” minimum diameter, cast iron, arch style, valve boxes. Boxes shall be telescopic, extendable to accommodate 7’ bury. Lid shall be two piece threaded, with a plug having a pentagonal bolt for removal.

Ford, Mueller, or approved equal.

**SWIMMING POOL AND FISH HATCHERY/AQUARIUM WATER VALVES**

BALL VALVES:

6" and smaller, three piece body, full port design, for use with PVC or CPVC piping, PVC or CPVC thermoplastic construction with self-lubricating teflon seats and EDPM or FPM O-ring seals, rated 150 psi at 73 deg. F, with external adjustment for seat wear, dual (true) union, with flow direction arrow molded in operating handle, threaded or socket ends. Nibco Tru-Bloc/Tru Union or equal.

CHECK VALVES:

4" and smaller, three piece body, ball check type, for use with PVC or CPVC piping, PVC or CPVC thermoplastic construction, with EDPM or FPM O-rings, rated 150 psi at 73 deg F, with dual (true) union ends, threaded or socket ends. Nibco/Chemtrol True Union Ball Check or equal.

**PURE WATER VALVES**

DIAPHRAGM VALVES:

2" smaller, polypropylene type 1 homopolymer construction ASTM D-4101 and D-2146, butt fusion or spigot ends, rated 150 psi at 68 deg. F, PTFE/Teflon diaphragm seals with EDPM backing, wheel handle operated. George Fischer type 315 or equal.

2-1/2" thru 4", polypropylene type 1 homopolymer construction ASTM D-4101 and D-2146, flanged connections, rated at 150 psi at 68 deg. F, PTFE/Teflon diaphragm seals with EDPM backing, wheel handle operated. George Fischer type 317 or equal.

CHECK VALVES:

2" and smaller, three piece body, ball check type, polypropylene type 1 homopolymer construction ASTM D-4101 and D-2146, fusion socket, rated 150 psi at 68 deg. F. George Fischer type 360 or equal.

Polypropylene valves, unions, flanges, fittings to be constructed of same materials as pipe and fittings and compatible with the piping installed in the system.

**WASTE SYSTEM VALVES**

Gate valves:

2-1/2" and larger: Iron body, bronze trim, bolted bonnet, O.S. & Y., solid wedge, flanged, suitable for 200 psi WOG. Crane 465-1/2, Hammond IR1140, Lunkenheimer 1430, Milwaukee F2885, Nibco F617-O, Powell 1793, Stockham G623.

Ball valves:

3" and smaller: Two piece bronze body; sweat or threaded ends, chrome plated bronze ball; glass filled teflon seat; teflon packing and threaded packing nut; blowout-proof stem; 400 psig WOG. Apollo 70-200, Milwaukee BA150, Nibco S585-70, Watts B-6001.

Swing check valves:

1-1/2" and smaller: Bronze body, threaded ends, Y-pattern, regrindable bronze seat, renewable bronze disc, Class 125, suitable for installation in a horizontal or vertical line with flow upward. Crane 1342, Hammond IB941, Nibco S413B, Watts CVYS.

2" and larger: Cast iron body, flanged ends, bronze trim, bolted cap, renewable bronze seat and disc, Class 125, non-asbestos gasket, outside lever and weight or spring, suitable for installation in a horizontal or vertical line with flow upward. Crane 383, Milwaukee F2974, Nibco F918B.

Spring loaded check valves:

2" and smaller: Bronze body, sweat or threaded ends, bronze trim, stainless steel spring, stainless steel center guide pin, Class 125, teflon seat unless only bronze available. ConBraCo 61 series, Mueller 203BP, Nibco S480Y, Val-Matic S1400 series.

2-1/2" and larger: Cast or ductile iron body, wafer or globe type, bronze trim, bronze or EPDM seat, stainless steel spring, stainless steel stem if stem is required, Class 125. APCO 300 or 600 series, Centerline CLC with full body option, Hammond IR9354, Milwaukee 1800 series, Mueller Steam 101AP or 105AP, Nibco W910 or F910, Val-Matic 1400 or 1800 or 8000 series.

**NATURAL GAS SYSTEMS**

Shut-off valves:

4" and smaller: Ball or eccentric plug valve, bronze or cast iron body, 2" and under threaded ends, 2-1/2" and over flanged ends, chrome plated bronze ball, bronze or nickel plated cast iron plug, TFE or Hycar seats and seals, lever handle, 175 psi W.O.G., U.L listed for use as natural gas shut-off. Apollo 80-100, DeZurik 425, Milwaukee, Nibco and Watts equals.

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.

Exterior below grade shut-off valves:

Plug or ball valve, body of same polyethylene type as piping system, pipe stub ends, high strength plastic stem and operating nut, position indicator, polyethylene plug or polypropylene ball, Buna-N seats and double stem seals, rated for 96 psi natural gas service (150 psi non-lethal service).

Gas pressure regulators:

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

**COMPRESSED AIR SYSTEMS**

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.

Safety exhaust shut-off valves:

3" and smaller: Two or three piece bronze body; threaded ends, chrome plated bronze ball; downstream vent port; glass filled teflon seat; teflon packing and threaded packing nut; blowout-proof stem; 175 psig WOG. Apollo 70-100-41, Watts B-6000, Milwaukee or Nibco equals.

Pressure reducing valves:

Bronze or aluminum body and trim, diaphragm or balanced piston, 250 psig maximum, 0-125 psig adjustable output, internal relief, 1/4" outlet gauge tapping.

**SPECIALTY VALVES AND VALVE ACCESSORIES**

Gauge valves:

Use 1/4" ball valves. Needle valves and gauge cocks will not be accepted.

Water pressure reducing valves:

Bronze body, diaphragm operated, with an integral thermal expansion bypass valve, inlet union, stainless steel strainer, renewable monel or stainless steel seat and adjustable reduced pressure range, 300 psig at 160 degrees F. Pre-set for the scheduled pressure. A. W. Cash, Conbraco, Watts, Wilkins.

Safety relief valves:

Bronze body, temperature and pressure actuated, stainless steel stem and spring, thermostat with non-metallic coating, test lever, suitable for 125 psig water working pressure at 240 degrees F, sized for full BTUH input and operating pressure of equipment, with valve capacity on metal label. For equipment less than or equal to 200,000 BTUH input, provide AGA, UL or ASME listed and labeled valve. Provide ASME listed and labeled valve for larger equipment. Bell & Gossett, A. W. Cash, Conbraco, Watts, Wilkins. Temperature and pressure relief valve shall be sized per AGA rating for BTUH input, Re: SPS 382.40(5)(d).

Sewer air and vacuum valves:

Combination air release/air and vacuum valve consisting of cast iron elongated body; **\_\_**" threaded inlet and **\_\_**" outlet; stainless steel valve, trim and float; Hycar or Buna-N rubber seat; inlet, backflushing and blowoff valves; 5' backflushing hose with quick disconnect fittings; 150 psig. Apco Series 440 SCAV, Crispin S20A/S20 Series, Val-Matic 800 Series.

***Inlet and outlet sizes must be selected and specified for each project.***

**PART 3 - EXECUTION**

**GENERAL**

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

Mount valves in locations which allow access for operation, servicing and replacement.

Provide valve handle extensions for all valves installed in insulated piping.

Install all valves with the stem in the upright or horizontal position. If possible, install butterfly valves with the stem in the horizontal position. Valves installed with the stems down will not be accepted.

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

**SHUT-OFF VALVES**

Install shut-off valves at each piece of equipment, at each branch take-off from mains for isolation or repair and elsewhere as indicated.

**BALANCING VALVES**

Install where indicated on the drawings and details for balancing of flow in pumped hot water recirculation piping systems.

Upon project completion, adjust each valve and set position stop. Balance system to minimum flow in return piping branches needed to maintain even supply water temperature throughout building.

**DRAIN VALVES**

Provide drain valves for complete drainage of all systems. Locations of drain valves include low points of piping systems, downstream of riser isolation valves, equipment locations specified or detailed, other locations required for drainage of systems and elsewhere as indicated.

**SPRING LOADED CHECK VALVES**

Install a spring loaded check valve in each circulating pump discharge line, each clearwater sump pump discharge line and elsewhere as indicated.

**SWING CHECK VALVES**

Install swing check valves in recirculation branch lines and elsewhere as indicated. Provide weighted swing check valves at sanitary sump pump discharges.

**PRESSURE REDUCING VALVES**

Provide ball valve and strainer at inlet and ball valve at outlet. Install pressure gauges to indicate inlet and outlet pressure at each pressure reducing valve.

**SAFETY RELIEF VALVES**

Install relief valves on all pressure vessels and elsewhere as indicated. Inlet and outlet piping connecting to valves must be the same size as valve connections or larger. Pipe discharge to drain where indicated or to floor.

**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.

**COMPRESSED AIR VALVES**

Install shut-off valves at each piece of equipment, base of drip legs and elsewhere as indicated. Install safety exhaust shut-off valves at terminal equipment designed for frequent removal. Install pressure reducing valves at filter stations and elsewhere as indicated. Mount in readily accessible location for gauge and maintenance access.

**SEWER AIR AND VACUUM VALVES**

Install sewer air and vacuum valves at high points of forcemains, at grade changes, every 1/2 mile on lines with little gradient and elsewhere as indicated. Locate in valve manhole with watertight cover, sealed to top of main and of sufficient depth to prevent freezing. Mount valves allowing access in manhole for backflushing and servicing.

END OF SECTION