

SECTION 15100 – VALVES

PART 1 – GENERAL

1.1 DESCRIPTION

This section includes materials, testing, and installation of manually operated valves.

Manual valves to be supplied and installed per ANSI/AWWA C504, C507, and C509, unless noted otherwise below.

1.2 RELATED SECTIONS SPECIFIED ELSEWHERE

All related work specified elsewhere, or in other codes or standards, will be as last revised, unless a specific date of issuance is called out in opposition to later revision date(s).

Other sections of the technical specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

- A. Section 01300 – Submittals
- B. Section 02223 – Trenching, Backfilling, and Compacting
- C. Section 03300 - Concrete
- D. Section 09900 – Painting and Coating
- E. Section 15000 – Piping Components
- F. Section 15042 – Hydrostatic Testing of Pressure Pipelines
- G. Section 15102 – Resilient-Wedge Gate Valves
- H. Section 15103 – Butterfly Valves

1.3 APPROVED MANUFACTURERS AND MODELS

- A. Ball Valves – Above ground Smaller Than 3 Inch
Per plans and specifications.
- B. Gate Valves - 3 Inch and Smaller
Per plans and specifications.
- C. Butterfly Valves
Per VWD Approved Material List, latest edition.
- D. Resilient - Seated Wedge Gate Valves: 4 Inch through 24 Inch
Per VWD Approved Material List, latest edition.
- E. Valve Boxes
Per VWD Approved Standard Drawing W-14.

1.5 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

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Except as otherwise indicated, the current editions of the following standards apply to the Work of this section:

ANSI/ASME B16.1	Cast Iron Pipe Flanges and Flanged Fittings
ANSI/ASME B16.5	Pipe Flanges and Flanged Fittings
ANSI/ASME B16.47	Large Diameter Steel Flanges: NPS 26 through NPS 60
ANSI/ASME B1.20.1	Pipe Threads (Inch), General Purpose
ASME B16.10	Face to Face and End to End Dimensions of Valves
ASME B16.34	Valves, Flanged Threaded and Welding End
ASTM A36	Standard Specification for Carbon Structural Steel
ASTM A48	Standard Specification for Gray Iron Castings
ASTM A126	Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings
ASTM A216	Standard Specification for Steel Castings, Carbon Suitable for Fusion Welding for High Temperature Service
ASTM A351	Standard Specification for Steel Castings, Austenitic, Austenitic-Ferritic (Duplex), and Pressure-Containing Parts
ASTM A395	Standard Specification for Ferritic Ductile Iron Pressure Retaining Castings for Use at Elevated Temperatures
ASTM A515	Standard Specification for Pressure Vessel Plates, Carbon Steel, for Intermediate and Higher Temperature Service
ASTM A536	Standard Specification for Ductile Iron Castings
ASTM A743	Standard Specification for Castings, Iron-Chromium, Iron-Chromium-Nickel, Corrosion-Resistant, for General Purposes
ASTM B61	Standard Specification for Steam or Valve Bronze Castings
ASTM B62	Standard Specification for Composition Bronze or Ounce Metal Castings
ASTM B148	Standard Specification for Aluminum-Bronze Sand Castings
ASTM B584	Specification for Copper Alloy Sand Castings for General Applications
ASTM D429	Standard Test Methods for Rubber Property – Adhesion to Rigid Substrates
ANSI/AWWA C110	Ductile-Iron and Gray-Iron Fittings
ANSI/AWWA C115	Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges
ANSI/AWWA C207	Steel Pipe Flanges for Waterworks Service – Sizes 4 inch Through 144 Inch
ANSI/AWWA C210	Liquid-Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines
ANSI/AWWA C213	Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines
ANSI/AWWA C504	Rubber-Seated Butterfly Valves
ANSI/AWWA C509	Resilient-Seated Gate Valves for Water Supply Service
ANSI/AWWA C512	Air-Release, Air/Vacuum, and Combination Air Valves for Waterworks Service
ANSI/AWWA C515	Reduced-Wall, Resilient-Seated Gate Valves for Water Supply Service
ANSI/AWWA C550	Protective Epoxy Interior Coatings for Valves and Hydrants
SSPC SP 2	Hand Tool Cleaning
SSPC SP 5	Joint Surface Preparation White Metal Blast Cleaning

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MSS SP6	Standard Finishes for Contact Faces of Pipe Flanges and Connecting-End Flanges of Valves and Fittings
MSS SP25	Standard Marking Systems for Valves, Fittings, Flanges, and Unions

1.6 SUBMITTALS

Contractor shall furnish submittals in accordance with the requirements of Standard Specifications. The following submittals are required:

- A. Product data from manufacturer, calculations, manufacturer's catalog data and detail construction sheets showing all valve parts and describing material of construction by material and specification (such as AISI, ASTM, SAE, or CDA). Submittal shall include valve dimensions including laying lengths and dimensions, orientation of valve operators, port sizes, number of turns, and required torque input of the actuator to be used. Information shall be submitted on valve handles, hand wheels, actuators, position indicators, limit switches, integral control systems, needle valves, and control systems. Submittal shall show location of internal stops for gear actuators. Submittals shall also indicate valve linings and coatings with manufacturer's and paint numbers listed. Contractor shall indicate the size, quantity and pressure rating of valves, including the class and drilling pattern of the flanges where applicable.
- B. Manufacturer's certification that products comply with the requirements set forth in the Standard Specifications.
- C. Manufacturer's certification that all linings and coatings have been factory tested for holidays and lining/coating thickness and comply with the indicated requirements. Include factory test data.
- D. For valves requiring certified tests, submit certified test results.
- E. A schedule of valves to be labeled, indicating in each case the valve location, station, valve structure, type, manufacturer, size, pressure rating, drilling pattern, model number of each valve and type, manufacturer, model number of each valve operator, and the proposed wording for the label.
- F. Operation and maintenance data shall be submitted and shall include, but not be limited to, the following information:
 1. Manufacturer's installation and operating instructions.
 2. Manufacturer's maintenance procedures.
 3. List of special tools.
 4. Schedule of valves indicating valve identification and location.
 5. Spare Parts List: A spare parts list shall be provided with information for each valve assembly.

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1.7 APPLICATION

A. Flanged End

All valves connecting to mains shall be flanged on at least one side and bolted to the fitting on the main.

B. Single Type of Valve

The contractor shall choose an approved valve and then use only that valve throughout the project.

C. Detector Check and Backflow Prevention Assembly

Isolation valves on a detector check or backflow prevention assembly are to be part of an integral unit, furnished and assembled by the manufacturer of the device.

D. Butterfly Valves

Butterfly valves shall only be considered for approval on lines 14 inches and larger or as specifically shown on the plans.

E. Resilient-Seated Wedge Gate Valves

Resilient-seated wedge gate valves shall be used on all pressure class 150 lines 6 inch through 24 inch or as specifically shown on the plans.

1.8 DELIVERY, STORAGE, AND HANDLING

Valves shall be delivered and stored in accordance with ANSI/AWWA C550. The port openings shall be covered with plastic, cardboard or wood while in transit and during storage in the field. These covers shall remain in place until valves are ready to be installed. Valves shall not be stored in contact with bare ground. Valves shall not be stacked.

PART 2 – PRODUCTS

2.1 GENERAL

- A. Valves shall be installed complete with operating handwheels or levers, extension stems, worm gear operators, operating nuts, chainwheels, chains, and wrenches required for operation.
- B. Valves shall have the name of the manufacturer, the size of the valve, and the date of manufacture cast or molded onto the valve body or bonnet or shown on a permanently attached plate. Do not attach ID plates to the valve body or bonnet for gate valves.
- C. Valve body and trim casting shall be of domestic origin.
- D. Coordinate the drilling pattern and orientation of bolt holes between valves and adjacent flanges. Use only flat-faced flanges for all valves.
- E. Bolts, nuts, and washers for flanged valves shall conform to the Standard Specifications .

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- F. Gaskets for flanged end valves shall be NSF-61 only as described in the Standard Specifications.
- G. All valves shall be new and of current manufacture. Valves shall be furnished and installed by the Contractor at the location and in accordance with the type of ends as shown on the Plans and as specified herein. Where not indicated, the valves shall have the same type of connection as the pipeline in which valves are to be installed and conform to the Specifications.
- H. The Contractor shall furnish and install each specific type of valve from a single manufacturer and use it throughout the Work.

2.2 VALVES

A. ABOVE GROUND BALL VALVES 3 INCHES AND SMALLER

- 1. Aboveground threaded end ball valves, 1/4 inch through 3 inches, for water service shall be full bore port ball type having a minimum working pressure of 200 psi WOG. Valves shall have plastic coated lever operators.
- 2. Materials of construction shall be as described below:

Component	Material	Specification
Body	Bronze	ASTM B 62
Ball	Bronze	ASTM B 62
Seat, Seals	Teflon	
Stem	Bronze or Copper silicon	ASTM B 62, B 99 (Alloy 651), B 584 B 371 (Alloy 694)

- 3. Stem material shall have a minimum tensile strength of 60,000 psi and a minimum yield strength of 30,000 psi.

B. GATE VALVES 3 INCHES AND SMALLER

- 1. Valves shall conform to AWWA C500 and the following:
- 2. Gate valves shall be designed for a working pressure of 200 psi or 250 psi as required.
- 3. Gate valves shall be furnished with ends as specified on plans or by the District.

C. TAPPING VALVES

- 1. Tapping valves shall conform to all requirements for gate valves 6 inches and larger and the additional requirements listed herein.
- 2. All valve ends shall be flanged. The flange on one end shall have slotted bolt holes to fit all standard tapping machines.
- 3. Seat rings shall be oversized to permit the use of full-size cutters.

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4. Resilient-seated wedge gate valves may be used as tapping valves, provided that the disk fully retracts to produce a full port opening.

D. BUTTERFLY VALVES

Butterfly valves shall be in accordance to the Standard Specifications.

E. RESILIENT-SEATED WEDGE GATE VALVES

Resilient-seated wedge gate valves shall be in accordance to the Standard Specifications.

F. MISCELLANEOUS VALVES

1. Hose Bibbs and Valves: Hose bibbs shall be furnished and installed in the locations shown on the Plans and shall be of the sizes required. They shall be brass hose valves, Crane 58 or approved equal. Hose valves shall be Crane 117 or approved equal, with National Standard threads, cap, and chain.
2. Globe valves smaller than two-inches (2”) in diameter shall have threaded ends, bronze bodies per ASTM B62 with union bonnets for class 150 rating. Globe valves shall contain a Teflon disc, brass or bronze disc holder and nut per ASTM B62, malleable iron hand wheel, bronze packing nut per ASTM B584, copper-silicon bronze stem per ASTM B371, and shall have non-asbestos fiber with Teflon packing.

G. CORPORATION STOPS – BRONZE, 2 INCHES AND SMALLER

1. Stops per Approved Material List, latest edition. Use either flared tube fittings for working pressures from zero to 150 psi, or solder joint fittings for working pressures from zero to 300 psi.

H. BALL VALVES – BRONZE, 2 INCHES AND SMALLER

1. Ball valves per Approved Materials List, latest edition. Use a lever handle for non-buried installations and a tee handle for buried installations.

2.3 VALVE OPERATORS

- A. Provide lever or wrench operators having adjustable, "position indicator" for exposed valves smaller than 6 inches.
- B. Provide 2-inch ANSI/AWWA operating nuts for buried and submerged valves.
- C. Gear operators shall be enclosed, suitable for running in oil with seals provided on shafts to prevent entry of dirt and water into the operator. Gear operators for valves located above ground or in vaults and structures shall have handwheels. Minimum handwheel diameter shall be 12 inches. The operator shall contain a dial indicating the position of the valve disc or plug. Gear operators for buried or submerged valves shall have 2-inch square AWWA operating nuts.
- D. For buried or submerged service, provide watertight shaft seals and watertight valve and actuator cover gaskets.

Provide totally enclosed operators designed for buried or submerged service.

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- E. Traveling nut and worm and gear operators shall be of the totally enclosed design so proportioned as to permit operation of the valve under full operating head with a maximum pull of 80 pounds on the handwheel or crank and shall be fully grease packed. Provide stop limiting devices in the operators in the open and closed positions. Operators shall be of the self-locking type to prevent the disc or plug from creeping. Design operator components between the input and the stop-limiting devices to withstand without damage a pull of 200 pounds for handwheel or chainwheel operators and an input torque of 300 foot-pounds for operating nuts when operating against the stops.
- F. Operators on buried valves shall produce the required torque on the operating nut with a maximum input of 150 foot-pounds.
- G. Valve operators, handwheels, or levers shall open by turning counterclockwise.

2.4 PAINTING AND COATING

- A. Coat metal valves (except bronze and stainless-steel valves) located above ground or in vaults and structures in accordance with the Standard Specifications. Apply the specified prime coat at the place of manufacture. Apply finish coat in field. Finish coat shall match the color of the adjacent piping. Coat handwheels the same as the valves.
- B. Coat buried metal valves at the place of manufacture per the Standard Specifications. Valves shall be holiday-free tested at the factory.
- C. Valves 4 inches and larger shall be coated on their interior metal surfaces excluding seating areas and bronze and stainless-steel pieces in accordance with AWWA C550 and these specifications. Surfaces shall be sandblasted in accordance with SSPC SP-5. Remove all protuberances which may produce pinholes in the lining. Round all sharp edges to be coated. Remove any contaminants which may prevent bonding of the lining. Coat the interior ferrous surfaces using one of the following methods:
 - 2. Apply powdered thermosetting epoxy (Scotchkote 134 or equal) per the manufacturer's application recommendations to a thickness of 8 to 10 mils.
 - 3. Apply two coats of catalytically setting epoxy (Keysite 750, Gilpon, or equal) to a dry-film thickness of 8 to 10 mils total. Follow the paint manufacturer's application recommendations including minimum and maximum drying time between the required coats.

All valve coatings shall be factory applied per the Approved Materials List, latest edition. Coating applied by the valve distributor will not be permitted. Touch up and repair of valve coatings shall be only done by authorized factory distributors.

2.5 VALVE BOXES FOR BURIED VALVES

- A. Valve extension pipe material shall be 8-inch SDR-41 PVC, white.
- B. Valve boxes and caps shall be per VWD standard drawings W-14 and W-16.

2.6 EXTENSION STEMS FOR BURIED VALVE OPERATORS

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- A. Where the depth of the valve is such that its centerline is more than 4 feet below grade, provide operating extension stems to bring the operating nut to a point 24 to 30-inches below the surface of the ground and/or box cover.
- B. Extension stems shall be galvanized steel and shall be complete with 2-inch-square operating nut.
- C. Valve stem extensions shall be of a solid design (no pinned couplings permitted) with guides.

PART 3 – EXECUTION

3.1 LOCATION

Valve assembly shall be installed in a level section of pipe. No tap shall be installed within 18 inches to a valve.

3.2 JOINTS

- A. Bolt holes of flanged valves shall straddle the horizontal and vertical centerlines of the pipe run to which the valves are attached. Clean flanges by wire brushing before installing flanged valves. Clean flange bolts and nuts by wire brushing, lubricate threads with oil and graphite, and tighten nuts uniformly and progressively. If flanges leak under pressure testing, loosen or remove the nuts and bolts, reseal or replace the gasket, reinstall or retighten the bolts and nuts, and retest the joints. Joints shall be watertight.
- B. Clean threaded joints by wire brushing or swabbing. Apply Teflon joint compound or Teflon tape to pipe threads before installing threaded valves. Joints shall be watertight.
- C. Rubber ring grooves of valves shall be inspected before installation by the contractor for ridges or holes that would interfere with the rubber ring. Interferences with the rubber ring shall be corrected to a satisfactory condition or the valves replaced, as determined by the District. (All valves shall have the same rubber-ring groove profile as the groove of the pipe couplings furnished with the pipe.)

3.3 EXTERIOR PROTECTION

- A. All exposed flanges and other metal surfaces and all damaged coatings shall be per the Standard Specifications.
- B. Wrap buried valves with 8-mil clear polyethylene wrap per ANSI/AWWA C105 such that only the stem and operating nut are exposed. Polyethylene wrap shall be clear for use with potable water and purple for use with recycled water. Secure with 2” wide polyethylene or vinyl adhesive tape.

3.4 CONCRETE SUPPORTS

- A. Concrete shall be placed in accordance to the Standard Specifications.
- B. Valves shall be anchored in concrete as shown in VWD standard drawing W-15.
- C. Concrete supports are required under valves bolted to flanged fittings.
- D. Until supports are poured, valves may be temporarily supported by means approved by the

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District representative so that the pipe is not subjected to the weight of the valve. Temporary supports to be removed after permanent supports are poured.

- E. All concrete anchors and thrust blocks specified or required by the District representative are considered as part of the pipeline installation.
- F. The concrete shall be placed so that valves and valve operators will be accessible for repairs or replacement.

3.5 VALVE BOXES

- A. Valve boxes shall be firmly supported and shall be kept centered and plumb over the operating nut of the valve.
- B. Beveled sections of pipe will not be allowed at the top of the valve extension pipe. The top cut shall be square and machine made.
- C. During the construction of new tracts, the valve extension pipes for "key valves" shall extend well above the ground level to permit ease of location in case of emergency shutoffs.
- D. The box cover shall be flush with the surface of the finished pavement or at any other level designated by the District representative as per VWD standard drawing W-14.

3.6 BACKFILL

- A. All backfill within 24 inches of a valve shall be clean, washed sand, placed, and compacted in accordance with the Standard Specifications.

3.7 PRESSURE TESTING

- A. Valves requiring a factory hydrostatic test and holiday detection that are delivered to the site prior to approval will be subject to rejection. Valves shall be hydrostatically tested in the field in conjunction with the pipeline in which it is connected in accordance with the Standard Specifications.

3.8 VALVE FIELD TESTING

- A. Operate manual valves through ten full cycles of opening and closing. Valves shall operate from full open to full close without sticking or binding. If valves stick or bind, repair or replace valve and repeat the tests.
- B. Manual gear actuators for butterfly, ball and plug valves shall operate valves from full open to full close through ten cycles without binding or sticking. The pull required to operate handwheel- or chainwheel-operated valves shall not exceed 80 pounds. The torque required to operate valves having two inch AWWA nuts shall not exceed 150 foot pounds. If actuators stick or bind or if pulling forces and torques exceed the values stated previously, repair or replace the actuators and repeat the tests. Fully lubricate operators in accordance with the manufacturer's recommendations prior to operating.

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3.9 FIELD PAINTING AND COATING

- A. The exterior of valves installed above ground or exposed in vaults or enclosures shall be field painted in accordance with the Standard Specifications.

****END OF SECTION****