Section 15102 – ECCENTRIC PLUG VALVES

1. SCOPE. This section covers all eccentric plug valves. Plug valves shall be furnished complete with actuators and accessories as specified herein.

2. GENERAL.

2.01. Acceptable Products. Eccentric plug valves furnished under this section shall be manufactured by DeZurik, Milliken, Keystone, and Victaulic.

2.02. General Equipment Stipulations. The General Equipment Stipulations shall apply to the equipment furnished under this section.

2.03. Marking. The body of each valve shall be marked with the manufacturer's name, size, pressure rating, and the country of origin of the body casting. All markings shall be cast on the outside surface of the body. An identifying serial number shall be stamped on a corrosion-resistant plate attached to the valve body.

2.04. Shop Painting. All interior and exterior ferrous metal surfaces, except bearing and finished surfaces and stainless steel components of valves and accessories, shall be shop painted for corrosion protection. The valve manufacturer's standard coating will be acceptable provided it is functionally equivalent to the specified coating as is compatible with the specified field painting.

The following surfaces shall be painted:

Unfinished Surfaces	
Interior Surfaces	Epoxy.
Exterior Surfaces of Valves	Epoxy.
Polished or Machined Surfaces	Rust-preventive compound.
Actuators and Accessories	Rust-inhibitive primer.

Interior epoxy coatings shall comply with AWWA C550 and shall be free of holidays. The total dry film thickness of shop-applied coatings shall be not less than:

Type of Coating	Minimum Dry Film Thickness
Epoxy	10 mils
Rust-Inhibitive Primer	3 mils

2.05. Temporary Number Plates. Each eccentric plug valve shall be factory tagged or marked in such a manner as to identify the valve by number or service.

2.06. Permanent Number Plates. Each plug valve, except buried or submerged valves, shall be provided with a permanent number plate. Numerals shall be not less than one inch high and shall be black baked enamel on anodized aluminum plate. The location of number plates and the method of fastening shall be acceptable to the Engineer.

3. MATERIALS. Materials used in the manufacturer of eccentric plug valves shall be as follows:

Body	Cast iron, ASTM A126, Class B; or ductile iron, ASTM A536, Grade 65-45-12.
Plug	Cast iron, ASTM A126, Class B.
Plug Facing	Neoprene or Buna-N, 70 Type A durometer hardness in accordance with ASTM D2240.
Body Seat	Welded nickel overlay.
Upper and Lower Trunnion Bearings	Sleeve type; stainless steel.
Upper Bearing	TFE or Delrin.
Stem Seal	V-type packing or U-cups, Buna-N or TFE.
Shop Coatings	
Epoxy	Cook “920-W-965 Epicon-MW HB Epoxy”, Kop-Coat “Hi-Gard Epoxy”, Tnemec “Series 20 Pota-Pox”, or Valspar “78-W-3B Val-Chem Hi-Build Tank Epoxy”.
Rust-Inhibitive Primer	Cook “391-N-167 Barrier Coat”, Kop-Coat “340 Gold Primer”, Tnemec “37-77 Chem-Prime”, or Valspar “13-R-28 Chromox Primer”.

Rust-Preventive Compound	Houghton "Rust Veto 344" or Rust-Oleum "R-9", or equal.

4. VALVE CONSTRUCTION.

4.01. Valve Body. The valve port area of each valve shall be at least 80 percent of the cross section of the connecting piping. Valves shall provide tight shutoff at the rated pressure from either direction. An adjustable closed position plug stop shall be provided.

Each valve body shall be plainly marked to indicate the seat end. Actual length of 10-inch and smaller valves shall be within 1/16 inch (plus or minus) of the theoretical length. Actual length of 12-inch and larger valves shall be within 1/8 inch (plus or minus) of the theoretical length.

Valve ends shall be compatible with connecting piping. Unless otherwise specified or indicated on the drawings, all valves shall have flanged ends. Flange diameter and drilling shall conform to ANSI B16.1, Class 125. Flanges shall be flat faced and finished to true plane surfaces within a tolerance limit of 0.005 inch. The finished face shall be normal to the longitudinal valve axis within a maximum angular variation tolerance of 0.002 inch per foot of flange diameter. Grooved end dimensions shall conform to AWWA C606, Table 5, for rigid joints. When grooved end valves are to be installed in flanged piping, two flange adapters compatible with the connecting piping shall be provided with each valve. Mechanical joint ends shall conform to ANSI/AWWA C111/A21.11.

Valve bodies shall be rated for a working pressure of at least 175 psi for 12-inch and smaller valves and 150 psi for 14-inch and larger valves.

4.02. Plug. The plug shall be of one-piece construction and shall have a cylindrical or spherical seating surface eccentrically offset from the center of the plug shaft. The interference between the plug face and body seat, with the plug in the closed position, shall be externally adjustable in the field with the valve in the line under pressure. Plug surfaces shall be faced with a resilient material as specified.

4.03. Seats. Seats shall be cast in the body and shall have raised, welded-in nickel overlay not less than 0.050-inch thick on all surfaces in contact with the plug face. The overlay shall be at least 90 percent nickel and have a Brinell hardness of 200 or greater.

4.04. Stem Seals. The valve shaft shall be sealed by U-cups or by at least four self-adjusting chevron type packing rings. Seals shall be adjustable and replaceable without removing the bonnet.

4.05. Grit Seals. The bearing and seal area shall be protected with grit seals.

5. VALVE ACTUATORS. Each valve actuator shall be designed to open or close the valve under all operating conditions. Actuators shall be designed for the maximum pressure differential across the valve as set forth in the Plug Valve Schedule.

Actuator mounting arrangements and handwheel or chainwheel positions shall be as indicated on the drawings or as directed by the Engineer.

5.01. Manual Actuators. All valves shall be provided with manual actuators. Unless otherwise indicated or specified, each geared manual actuator shall be equipped with an operating handwheel. Unless otherwise required by the Owner, the direction of rotation of the wheel, wrench nut, or lever to open the valve shall be to the left (counterclockwise). Each valve body or actuator shall have cast thereon the word "Open" and an arrow indicating the direction to open.

Totally enclosed geared actuators shall be provided on all 8-inch and larger valves, on all 6-inch and larger throttling valves, on all 6-inch and larger valves where the unseating pressure exceeds 25 psi, on all 4-inch and larger buried valves, and on all valves to be designated chainwheel operated unless chain levers are indicated on the drawings. Unless otherwise indicated on the drawings or specified herein, all other 6-inch and smaller valves shall be lever operated.

Geared actuators for plug valves not listed in the Plug Valve Schedule in this section shall be rated for a differential pressure across the valve, on the seating side, of 100 psi for 8-inch and smaller valves and 50 psi for 10-inch and larger valves.

Manual actuators shall produce the required torque with a maximum pull of 80 pounds on the lever or handwheel. Actuator components shall withstand, without damage, a pull of 200 pounds on the handwheel or chainwheel or an input of 300 foot-pounds on the operating nut.

Unless otherwise specified, actuators for valves to be buried, submerged, or installed in vaults or manholes shall be sealed to prevent the entrance of water when submerged to a depth of 20 feet.

5.02.01. Handwheels. Handwheel diameters shall be at least 6 inches but not more than 16 inches for 30-inch and smaller valves and not more than 30 inches for 36-inch and larger valves.

5.02.02. Chainwheels. Unless specifically required to be equipped with other types of actuators, all valves with center lines more than 7 feet 6 inches above the floor shall be provided with chainwheels and operating chains. Each chainwheel operated valve shall be equipped with a chain guide which will permit rapid handling of the operating chain without "gagging" of the wheel and will also permit reasonable side pull on the chain. Suitable extensions shall be provided, if necessary, to prevent interference of the chain with adjacent piping or equipment. Operating chains shall be hot-dip galvanized carbon steel and shall be looped to extend to within 4 feet of the floor below the valve.

5.02.03. Lever Actuators. In any building or structure containing lever operated valves, at least two operating levers shall be provided for each size and type of lever operated valve.

5.02.04. Wrench Nuts. Wrench nuts shall be provided on all buried valves, on all valves that are to be operated through floor boxes, and where indicated on the drawings. Unless otherwise directed by the Owner, all wrench nuts shall comply with Section 3.16 of AWWA C500. At least two operating keys shall be furnished for operation of the wrench nut operated valves.

6. TESTING. Except as modified herein, eccentric plug valves shall be tested in accordance with Section 5 of ANSI/AWWA C504 entitled "Rubber-Seated Butterfly Valves". Each valve shall be performance tested in accordance with Section 5.2 and shall be given a leakage test and a hydrostatic test as described in Sections 5.2.2 and 5.2.3. The leakage test shall be applied to the seating face of the plug (tending to unseat the plug) at the rated pressure of the valve.

Each valve shall be leak tight in both directions when closed by the actuator with the maximum differential pressure applied to the plug as specified in the plug Valve Schedule.

7. EXTENSION STEMS. Extension stems and stem guides shall be furnished and installed where specified, indicated on the drawings, or otherwise required for proper valve operation. Extension stems shall be of solid steel and shall not be smaller in diameter than the stem of the valve actuator shaft. Extension stems shall be connected to the valve actuator by means of a Lovejoy "Type D" single universal joint with grease-filled protective boot. All stem connections shall be pinned.

At least two stem guides shall be furnished with each valve requiring stem guides. Stem guides shall be of cast iron construction, bronze bushed, and adjustable in two directions. Stem guide spacing shall not exceed 100 times the stem diameter or 10 feet, whichever is smaller. The top stem guide shall be designed to carry the weight of the extension stem. The extension stem shall have a collar; the collar shall be pinned to the stem and shall bear against the stem thrust guide.

Extension stems shall be provided for buried valves when the valve actuator is 4 feet or more below finished grade. Each extension stem for a buried valve shall extend to within 6 inches of the ground surface, shall be provided with spacers which will center the stem in the valve box, and shall be equipped with a wrench nut.

8. POSITION INDICATORS. Unless otherwise specified, each valve shall be provided with a position indicator to display the position of the plug relative to the body seat opening.

For valves installed in interior locations, the indicating pointer shall be mounted on the outer end of the valve operating shaft extension and shall operate over an indicating scale on the operating mechanism cover. A suitable stuffing box or other seal shall be provided to prevent the entrance of water where the shaft passes through the cover.

Position indicators will not be required for buried valves.

9. FLOOR BOXES. Where openings through concrete slabs are provided for key operation of valves with the operating nut being in or below the slab, such openings shall be provided with a

cast iron floor box complete with cover. Each floor box shall be of the depth required for installation in the slab indicated on the drawings. Where the operating nut is in the slab, the stem shall have a guide to maintain the nut in the center of the box; where below the slab, the opening in the bottom of the box shall permit passage of the operating key.

Each floor box and cover shall be shop coated by dipping in asphalt varnish.

10. VALVE BOXES. Each valve buried to a depth of 4 feet or less shall be provided with a slide type valve box. Valve boxes shall be cast iron, extension sleeve type, suitable for the depth of cover required by the drawings. Not more than one extension will be allowed with each slide type valve box. Valve boxes shall be not less than 5 inches in inside diameter, shall have a minimum thickness at any point of 3/16 inch, and shall be provided with suitable cast iron bases and covers. Valve boxes shall be Charlotte Foundry, or equal.

Each valve buried to a depth greater than 4 feet shall be provided with a valve box consisting of a cast iron cover and a 6-inch cast iron pipe section. The cover shall be a Clay & Bailey "No. 2193" or Tyler "Series 6890-A". The pipe shaft shall be sized to extend from the valve to 5 inches inside the valve box cover.

All parts of valve boxes, bases, and covers shall be shop coated by dipping in asphalt varnish.

Valves and valve boxes shall be set plumb. Each valve box shall be placed directly over the valve is serves, with the top of the box brought flush with the finished grade. After being placed in proper position, earth shall be filled in around each valve box and thoroughly tamped on each side of the box. A concrete protector ring shall be provided to encase the top section of each valve box that is not set in pavement. The concrete protector ring shall be set flush with the ground contours.

11. INSTALLATION. Unless otherwise permitted by the Engineer, all eccentric plug valves shall be installed with the shaft horizontal and the plug in the upper half of the valve body. Valves in sewage, sludge, or scum lines shall be installed with the valve seat on the upstream end.

12. PLUG VALVE SCHEDULE.

Valve No.	Size	Service	Type of Installation	Type of Actuator	Maximum Pressure Differential Across Valve	High Pressure Side of Plug
	inches				psi	

* * * REFER TO SPECIAL CONDITIONS * * *

The actuator of all valves shall be sealed to prevent the entrance of water below groundwater or submerged.

13. DRAWINGS AND DATA. Complete drawings, details, and specifications covering the valves and their appurtenances shall be submitted in accordance with the submittals section. Submittal drawings shall clearly indicate the country of origin of all cast gray iron and ductile iron valve components.

Certified copies of reports covering proof-of-design testing of valves, as set forth in Section 5.2 of ANSI/AWWA C504, and proof-of-design testing of the actuators, as set forth in Section 6 of ANSI/AWWA C540, together with an affidavit of compliance, as indicated in Section 1.7 of ANSI/AWWA C504 and Section 1.7 of ANSI/AWWA C540, shall be submitted to the Engineer before the valves are shipped.

In addition, the following drawings shall be submitted before fabrication of the valve control equipment for the pump check valves:

a. Curve plotting “Area of Opening in Percent of Full Opening” versus “Plug Rotation in Degrees”.

b. Curve plotting “Area of Opening in Percent of Full Opening” versus “Time of Valve Closure” for normal closing.

When requested by the Engineer, certified copies of physical and chemical test results shall be submitted for the materials of construction of valve components.

End of Section