SECTION 1411

BUTTERFLY VALVES

1411.0100 GENERAL

1411.0101 Description of Work.

A. The work under this section shall consist of furnishing all labor, materials and equipment required for the installation of butterfly valves, all in accordance with the details shown on the plans and requirements of these specifications.

B. The CONTRACTOR shall provide butterfly valves and appurtenances, complete and operable, in accordance with the Contract Documents, Plans and Specifications.

1411.0102 Reference Specifications, Codes and Standards

ANSI/ASME B16.1	Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, 350, and 800
ASME B 16.5	Pipe Flanges and Flanged Fittings
ASME B 16.34	Valves-Flanged and Butt welding End
ASTM A 48	Gray Iron Fittings
ASTM A 536	Ductile Iron Castings
ASTM A 564	Hot-Rolled and Cold-Finished Age-Hardening Stainless and Heat-Resisting Steel Bars, Wire, and Shapes
ASTM B 62	Composition Bronze Ounce metal Castings
AWWA C 207	Steel Pipe Flanges for Waterworks Service – Sizes 4-inch through 144-inch
AWWA C 504	Rubber-Seated Butterfly Valves
AWWA C 540	Power-Actuating Devices for Valves and Sluice Gates
AWWA C 550	Protective Interior Coatings for Valves and Hydrants
AWWA C213	Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines

SECTION 1411

1411.0103 Contractor Submittals

A. For 24-inch and larger valves, the CONTRACTOR shall furnish submittals within 14 days of contract award the following information. This information shall be submitted to the ENGINEER for approval prior to acceptance of the butterfly valve. When it is questionable that the manufacturers product conforms to the specifications, the OWNER reserves the right to require submittal of more complete information before approval of the valve. All submittals shall reference the project plan number and specification section. As a minimum the following information shall be submitted by the contractor.

1. Documentation of the manufacturer's qualifications, including name of facility, owner of facility, contact name, address, and telephone number.

2. Certification by the butterfly valve manufacturer that the valve manufacturer is responsible for the selection of the valve actuators and the actuators are sized for the specified pressure class.

3. Required documentation shall include, butterfly valve torque input requirements and actuator torque output with flow to both directions for asymmetrical discs, including the number of turns required to close the valve. Signed compliance for hydro and leak tests. Proof of design to AWWA C504 for AWWA butterfly valves.

4. Provide standard data and catalogues for the specific make, model and size of the butterfly valve being furnished. Information to include general arrangement drawings showing dimensions, weights and stem diameters. Parts drawings showing complete parts lists. Actuator parts drawings and number of turns to operate.

5. Provide information required to assemble, install operate and maintain the butterfly valve.

6. Provide certification that the butterfly valve and all component parts to be furnished are manufactured and tested in accordance with the latest edition of AWWA Standard C504.

7. Provide manufacturer's size, make and model number of the butterfly valve to be furnished.

8. The valve manufacturer shall be experienced in the manufacture of butterfly valves for at least 10 years. Submit a list of at least 10 of the manufacturer's butterfly valve installations in the U.S. of comparable size and complexity to units indicated in this Section.

SECTION 1411

1411.0104 Warranty

A. The butterfly valve manufacturer shall warrant all valves and their operator against material and workmanship defects for the Contract Warranty Period (2 years).

1411.0105 Shipping, Delivery, Storage and Handling. Prior to shipment of butterfly valves from the manufacturer's premises, The Engineer may require visual inspection of the butterfly valve to determine compliance with this specification. Butterfly valves shall be delivered to the site, stored, and handled in accordance with the manufacturer's instructions except as modified by the plans, special specifications, or as directed by the Engineer.

1411.0200 PRODUCTS

1411.0201 Materials.

(A) Standards. Butterfly valves and the materials used in their manufacturer shall comply with the most recent revision of the standards in Appendix B.

(B) Pressure Class. The design pressure for butterfly valves shall be 150 psi or 250 psi whichever is noted in the plans or special specifications.

(C) Stainless Steel. Stainless steel as specified herein shall be type 316 in accordance with ASTM A276 or ASTM A536.

(D) Component Parts. Butterfly valves covered by this specification are sized 16 inches and larger in diameter. Butterfly valves from 4" to 12" are for above ground applications only. Component parts of the butterfly valves shall be in accordance with AWWA C504. All butterfly valve components shall be tested and certified by an approved testing laboratory located in the United States. All parts shall be readily available.

1. General: Butterfly valves for water working pressures up to 150 psi shall conform to ANSI/AWWA C504; Class 150B, butterfly valves for water working pressures greater than 150 psi shall conform fully to the design requirements of ANSI/AWWA C-504, Class 250B subject to the following requirements. Valves shall be of the size and class indicated in the plans or specifications. All valves unless noted otherwise, shall be sized for bi-directional water service, full rated pressure and a line velocity of 16 feet per second. Lifting lugs will be provided for all valves 24" and larger.

2. End Connections: Valve ends shall be mechanical joint, conforming to AWWA C110 unless otherwise specified in the Contract Documents. Mechanical joint connection bolts and nuts shall be manufactured of cor-ten steel or approved equal in accordance with ASTM A242. Where specified in the Contract Document, valve ends shall be flanged in accordance with AWWA C110 for 125/150 lb flanges and ASME/ANSI B16.1 for 250/300 lb flanges through 48 inch. Above 48-inch, flange outside diameter, number of bolts, diameter of bolt circle, and diameter of bolts shall comply with ANSI/AWWA C207 Class E and the flange thickness shall be

designed in accordance with ASME Section VIII, flange design requirements. Flange connection bolts and washers shall be manufactured of 316 stainless steel and nuts be manufactured of 316 stainless steel with a Xylan coating or approved equal.

3. Body: Valve bodies shall be cast iron ASTM A-126, Class B or ductile iron ASTM A536 65-45-12 for valves sizes 3" to 20" and shall be ductile iron ASTM A536-65-45-12 for valves 24" and larger. In no case shall the minimum port diameter of the valve be less than 1-1/2 inches smaller than the nominal valve diameter.

4. Disc: The disc shall be ductile iron ASTM A536 65-45-12 for valves sizes 3" to 20" and shall be ductile iron ASTM A536 65-45-12 for valves 24" and larger. The disc seating edge shall be 316 stainless steel. The disc shall be mechanically fastened to the valve shaft using a 316 stainless steel squeeze pins, taper pins or a tangential pin locked in place with lock washers and Nylok nuts for valves larger than 24". The valve disc for valve 30" and larger valves shall incorporate in its design an off-set disc design to provide an uninterrupted 360-degree seating edge and a flow-through disc design to increase flow. Disc containing hollow chamgers or any surfaces t hat cannot be coated and inspected shall not be acceptable. Rubber seats retained on the disc shall not be acceptable.

5. Shaft: Valve shafts shall be stainless steel ASTM A276 Type 316 for Class 150B valves and stainless steel ASTM A564 Type 630 condition H-1100 or H1150 for class 250B. Valve shaft diameters shall comply with AWWA C504.

6. Seat: the peroxide cured EPDM rubber valve seats shall be epoxy retained in the valve body for 24" and larger valves. Valves sizes 3" through 20" the peroxide cured EPDM rubber seat shall be molded and bonded to the valve body. The EPDM rubber seat material shall not be sulfur cured. Valve seats shall be field adjustable and replaceable without disassembly of the disc and shaft and without removal from the line. Seats mechanically retained with the use of rings, segments, screws, or hardware of any kind and seats retained on the valve disc shall not be acceptable.

7. Shaft Seals: Shaft Seals shall be designed for use with standard self-compensating chevron style split-V type packing. Valves utilizing stuffing boxes are not acceptable.

8. Bearings: Valve bearings shall be of non cold-flowing, phenolic, stainless steel backed PTFE, or Teflon-lined fiberglass backed for sizes up to 24". Sizes smaller than 24" shall be nylon. All stainless steel parts shall be fabricated from ASTM A276 Type 316 stainless steel. All bronze parts shall conform to ASTM B 62 containing not more than 5 percent of zinc or more than 2 percent of aluminum with tensile strength of 60,000 psi, minimum yield strength of 40,000 psi, and an elongation of at least 10 percent in 2 inches.

9. Manual Actuators: Actuators shall conform to ANSI/AWWA C540, subject to the following requirements. All actuators shall be self-locking and shall hold the valve disc in the closed, open and any intermediate position without creeping or fluttering.

Unless otherwise indicated, all manually actuated butterfly valves shall have an AWWA 2 inch square operating nut. Actuators shall be of the totally enclosed, self-locking worm and gear or traveling nut type with adjustable stops, factory set, to limit disc travel. Actuator cases shall be designed for installation and operation in a buried or submerged location and shall be fully sealed and grease packed. Actuators shall be capable of withstanding an external water pressure of 10 psi without leakage into the interior of the operator. Actuators shall be sized to produce a torque of 1.5 times the required valve torque. The required valve torque shall be based on the rated pressure at 16 feet per second using the method described in AWWA C504. Stop limiting devices must withstand 300 ft. lbs of input torque without failure. Actuators for above ground installation shall be provided with a position indicator and hand wheel. Hand wheel shall be a minimum of 12 inches in diameter and shall be mounted on a 2 inch square operator nut. Hand wheels of larger diameter shall be noted on plans.

10. Minimum and Maximum number of revolutions of operator input shaft to open or close each valve in accordance with the following table, unless otherwise approved by the Engineer:

NOMINAL VALVE SIZE	MINIMUM # OF REVOLUTIONS	MAXIMUM # OF REVOLUTIONS
4-12	8-20	12-28
16	28	36
24	44	50
30	56	64
36	68	80
42	80	88
48	92	100
54	104	112
60	116	124
66	128	136
72	140	148

11. Hardware: All fasteners and hardware shall be type 316 Stainless Steel.

12. Protective coating:

    a) Internal Coating. All interior ferrous surfaces exposed to fluid flow shall be factory coated with two or more coats of a thermosetting or fusion bonded epoxy coating. The coating shall be safe for potable water used in accordance with ANSI/AWWA C504 and NSF61. The coating shall be holiday free and have a minimum total dry film thickness of 10-12 mils.

    b) External Coating. All exterior ferrous surfaces exposed to fluid flow shall be factory coated with two or more coats of a thermosetting of fusion bonded epoxy coating. The coating shall be safe for potable waster used in

accordance with ANSI/AWWA C504 and NSF61. The coating shall have a minimum total dry film thickness of 12 mils.

c) Protective Coating Testing: All internal ferrous surfaces shall be holiday free and shall be tested for coating thickness and porosity. Porosity shall be tested using the low voltage spark method.

d) Surface preparation, exterior and interior, shall be in accordance with SSPC-SP10 for near white blast cleaning prior to prime coat application.

13. Shop Testing:

a.) Provide notification to the ENGINEER to be present for shop testing of the butterfly valve or receive a waiver for ENGINEER witness of shop testing.

b.) Failure by the ENGINEER to inspect or witness tests at the manufacturer's plant shall not be construed as waiving inspection upon delivery.

c.) Valve Body Hydrostatic Test: Hydrostatic pressure test to twice the pressure rating of the valve to the inside of the valve per AWWA C504. During the hydrostatic test, there shall be no leakage through any portion of the valve, the metal, end flange joints or the valve shaft seal, and there shall be no permanent deformation of any valve component.

d.) Seat Leakage Test: All valves shall be seat leak tested per AWWA C504. The entire surface of the valve disc shall be visible through-out the testing. There shall be no indication of any water or air leaks during the test period. <u>This test shall be performed in both flow directions.</u>

e.) Protective Coating Testing: All specified holiday free surfaces coated with epoxy shall be tested for coating thickness and porosity. Porosity shall be tested using the low voltage spark method.

f.) Submit test reports to the ENGINEER showing each valve is in conformance.

1411.0300 INSTALLATION

1411.0301 General.

A. Valves shall be furnished with flanged ends when specified on the plans, special specifications, or as directed by the Engineer. Prior to ordering butterfly valves, the contractor shall verify the clearance of the valve disc and all connecting pipe.

B. Butterfly valves shall be installed in accordance with AWWA except as modified herein. All fittings, valves, flexible couplings, and repair clamps shall be encased with a 10 mils polyethylene in accordance with AWWA C-105 Method C.

C. Valves designed for underground service shall be installed with the valve shaft in a horizontal position and the operating shaft vertical, unless otherwise noted. Operating nut shall be installed either south or west of the pipeline.

D. All personnel of the contractor or subcontractor shall be skilled and knowledgeable with regard to the installation procedures for the valves and appurtenances being installed.

E. Prior to installation. The contractor shall operate each valve from total open to totally close to allow the Engineer to record the total number of turns 16 inch and larger on the "As-Built" construction plans. Each valve shall be inspected in the closed position to assure proper closure and seating prior to installation.

1411.400 MANUFACTURERS LIST

1411.401 Manufacturers. Manufactures for 3 inch and larger butterfly valves shall be as follows:

A. Henry Pratt Company

B. Sartell Valve Company (DeZurik)

BFV Actual MR

Minimum and Maximum number of revolutions of operator input shaft to open or close each valve in accordance with the following table:

NOMINAL VALVE SIZE	MINIMUM # OF REVOLUTIONS	MAXIMUM # OF REVOLUTIONS
3-12	20	35
14-16	25	40
18-20	30	45
24	35	50
30	40	55
36	40	80
42	70	150
48	150	250
54	150	250
60	200	350
66	200	350
72	200	350