SECTION 02405
BUTTERFLY VALVES

PART I: GENERAL

1.1 GENERAL REQUIREMENTS
- A. Butterfly valves.

1.2 MEASUREMENT AND PAYMENT
- A. Unit Prices:
  1. Payment for butterfly valves twenty inches (20 In) in diameter and smaller shall be on the unit price basis for each.
  2. Payment for butterfly valves twenty-four inches (24 In) in diameter and greater is on a unit price basis.
  3. Refer to Section 01270 – Measurement and Payment for unit price procedures.
- B. Stipulated Price (Lump Sum):
  1. If Contract is Stipulated Price Contract, payment for work in this Section is included in Total Stipulated Price.

1.3 REFERENCES
- A. ASME – American Society of Mechanical Engineers.
  1. ASME B16.1 – Cast Iron Pipe Flanges and Flanged Fittings.
- B. ASTM – American Society for Testing and Materials.
  1. ASTM A126 – Standard Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.
- C. AWWA – American Water Works Association.
  1. AWWA C504 – Standard for Rubber-Seated Butterfly Valves.
  2. AWWA C550 – Standard for Protective Interior Coatings for Valves and Hydrants.
- D. CFTS – City of Friendswood Technical Specifications.

1.4 SUBMITTALS
- A. Conform to requirements of Section 01330 – Submittal Procedures.
- B. Submit manufacturer's product data for proposed valves and actuators for approval.
- C. Submit manufacturer's affidavit for proposed valves and actuators certifying compliance with the Technical Specifications.
- D. Submit manufacturer's affidavit that butterfly valves were manufactured in the United States and conform to applicable requirements of AWWA C504 and that they have been satisfactorily tested in the United States in accordance with AWWA C504 using test pressure of one hundred fifty pounds per square inch (one hundred fifty pounds per square inch (150 psi)) in both directions. Submit Proof-of-Design and hydrostatic testing procedure in accordance with AWWA C504.

E. Submit manufacturer's affidavit that coating for interior surfaces of valves conform to applicable requirements of AWWA C550. Submit results of holiday test and thickness measurements of coatings.

F. Furnish, at time of delivery, affidavit of compliance, as specified in Section 6.3 of AWWA C504 certifying compliance with applicable portion of AWWA C504 and modification or supplements herein. Furnish certified drawings and material test records by manufacturer covering items included in Section 4.3 of AWWA C504, for review. Furnish certified copies of test reports covering items in Sections 4.5.8.5.5, 4.5.8.5.8 and 5.2.1 through 5.2.4.3 of AWWA C504 for review.

G. Submit data indicating maximum torque required to open valve, maximum torsional strength of shaft and torque output of actuator.

H. Provide submittal information on CD-ROM in Adobe portable document format (*.PDF).

I. Include number of turns to operate valves to fully open/closed.

1.5 QUALITY CONTROL

A. Perform valve leakage tests in both directions at one hundred fifty pounds per square inch (150 psi) in factory and field. Hydrostatic field tests of one hundred fifty pounds per square inch (150 psi) shall be made against dished head plug or similar arrangement.

B. For purposes of interpreting referenced AWWA tests, the following shall apply: Shutoff pressure is one hundred fifty pounds per square inch (150 psi); cycle consists of rotating disc from fully opened to fully closed position, for valves larger than seventy-two inches (72 In), proof of design shall require one thousand (1000) cycles and shall be performed on valve greater than seventy-two inches (72 In) of like design and construction. When proof of design tests are performed on valve delivered to job site, replace disc, bushing, shaft and seals with new and unused items and test and certify as described above.

C. Hydrostatic Testing by Manufacturer:

1. Hydrostatic testing to be witnessed by the Project Manager prior to shipment of valves. Provide minimum four weeks (4 Wks) notice to the Project Manager to schedule witness testing. When possible, maximize number of valves to be tested during a plant visit, no more than two (2) visits shall be allowed per project to witness test valves, unless otherwise approved by the Project Manager. The City shall pay expenses for each visit up to total of two (2) visits incurred by the Project Manager to witness testing of each grouping of valve(s) per project. Expenses for subsequent or extended visits by the Project Manager for defective valves, improper scheduling or valve failures are to be paid by the Contractor. Witness of hydrostatic testing by the Project Manager shall only be in regards to compliance with this Technical Specification and shall not constitute approval by the Project Manager nor relieve the Contractor of obligations to

comply with the Contract Documents.

2. Document serial number on valve at time of testing and reflect in certified test records furnished to the Project Manager. Identification plate shall be permanently affixed to valve and actuator prior to hydrostatic testing.
3. Hydrostatic testing to conform to AWWA C504 except as modified below:
   a. Install actuator prior to hydrostatic testing. Test actuator to verify actual number of turns match manufacturer's published number of turns. Verify valve stops are in correct positions.
   b. Fully open and close valve prior to performing shell test and prior to each leakage test.
   c. Perform shell test first (1st).
   d. When tested with water, adequately dry seat and disc.
   e. When tested with air, fill top of valve with water to aid in viewing possible leakage.
   f. Pressure Gauges: Calibrated within past twelve months (12 Mos); zero pounds per square inch (0 psi) to five hundred pounds per square inch (500 psi) range in increments of five pounds per square inch (5 psi), present calibration certificates prior to hydrostatic testing.
   g. If seat adjustment is required during hydrostatic testing, perform valve leakage test again in both directions. Once seat adjustment is made, fully open and fully close valve three (3) times and repeat leakage test.
4. Field Testing
   a. When valve arrives at the job site, the Contractor shall operate valve fully open and closed twice in presence of the Project Manager. Document number of turns to open and close each time.
   b. Install operator nut plum.
   c. After valve is installed, repeat the operation test and document number of turns in presence of the Project Manager.
   d. Manufacturer's representative must be present to witness the operation test again at the substantial completion walk-through. Verify valve operate fully open/closed twice at the appropriate number of turns.

PART II: PRODUCTS

2.1 VALVES AND ACTUATORS

A. Butterfly Valves and Actuators: Provide approved butterfly valves and

actuators. Conform to AWWA C504, except as modified or supplemented herein.

B. If type of valve is not indicated on the Drawings, use butterfly valves for line valve sizes twenty-four inch (24 In) and larger. When type of valve is specified on the Drawings, no substitute shall be allowed, unless otherwise approved by the Project Manager.

C. Butterfly valves shall be short-body, flanged design and installed at locations as shown on the Drawings.

D. Direct-bury valves and valves in subsurface vaults shall open left (counterclockwise). Above-ground and plant valves shall open left (counterclockwise).

E. Provide flanged joints when valve is connected to steel or PCCP.

F. Butterfly Valves and Actuators (Additional Requirements for Large Diameter Water Lines):

1. Provide valves from approved manufacturer. Provide all valves for single project, from same manufacturer.
2. Valves larger than seventy-two inches (72 In) in diameter design: allowable stresses at rated pressure not to exceed one-third (1/3) of yield strength or one-fifth (1/5) of ultimate strength of material used.
3. Provide manual actuators for single project from same manufacturer.
4. Shaft connecting actuator to valve body must be fully enclosed. Valve bonnet and shaft extension to be fully enclosed and watertight.

2.2 VALVE CONSTRUCTION

A. Valves: AWWA C504, Class 150B. Body: Cast iron, ASTM A126, Class B. Flanges: ASME B16.1, Class 125 lb.

B. Discs for Butterfly Valves: Either cast iron or ductile iron. Valves greater than fifty-four inches (54 In) in diameter must utilize flow through disc.

C. Seats: Buna-N or neoprene and may be applied to disc or body. Seats shall be mechanically secured and shall not rely solely on adhesive properties of epoxy or similar bonding agent to attach seat to body. Seats on disc shall be mechanically retained by stainless steel (18-8) retaining ring held in place by stainless steel (18-8) cap screws that pass through rubber seat for added retention. When seat is on disc, seat shall be retained in position by shoulders located on both disc and stainless-steel retaining ring. Mating surfaces for seats: Type 304 or 316, stainless steel and secured to disc by mechanical means. Sprayed-on or plated mating surfaces shall not be allowed. Seat shall be replaceable in field for valves greater than thirty inches (30 In) in diameter. Valves with segmented retaining rings shall not be accepted.

D. Coat interior wetted ferrous surfaces of valve, including disc, with epoxy suitable for potable water conditions. Epoxy, surface preparation and epoxy application in accordance with AWWA C550 and coating

manufacturer's recommendations. Provide three (3) coats of two (2) component, high-build epoxy with minimum dry film thickness of twelve (12) mils. Provide approved epoxy coating. Coatings shall be holiday-tested and measured for thickness.

E. Valve shaft and keys: twenty-four inches (24 In) in diameter and greater valves require a minimum of two (2) taper pins used for attaching valve shaft to valve disc, use of torque plug for purposes of attaching valve shaft to valve disc is not permitted: Type 316 stainless steel. Shaft Bearings: Stainless steel, bronze, nylon or Teflon (supported by fiberglass mat or backing material with proven record of preventing Teflon flow under load) in accordance with AWWA C504. Sinter stainless steel bearing material. Design valve shaft to withstand three (3) times amount of torque necessary to open valve.

F. Packing: Self adjusting and wear compensating, full or split ring V-type and replaceable without removing actuator assembly.

G. Retaining Hardware for Seats: Type 304 or 316 stainless steel. Nuts and screws used with clamps and discs for rubber seats shall be held securely with locktight, or other approved method, to prevent loosening by vibration or cavitational effects.

H. Valve disc shall seat in position at ninety degrees (90°) to pipe axis and shall rotate ninety degrees (90°) between full-open and tight-closed position. Install valves with valve shafts horizontal and convex side of disc facing anticipated direction of flow, except where shown otherwise on the Drawings.

I. For valves utilizing retaining rings, tighten bolts to a uniform torque. Measure torque prior to testing valve.

2.3 VALVE ACTUATOR CONSTRUCTION

A. Provide actuators for valves with size based on line velocity of twelve feet per second (12 Ft/Sec) and unidirectional service and, unless otherwise shown on the Drawings, equip with geared manual actuators. Provide fully enclosed and traveling-nut type, rack-and-pinion type or worm-gear type for valves twenty inches (20 In) and smaller. Provide worm-gear type for valves twenty-four inches (24 In) and larger.

B. Provide actuator designed for installation with valve shaft horizontal unless otherwise indicated on the Drawings.

C. Provide bonnet extensions, as required, between valve body and actuator. Space between actuator housing and valve body shall be completely enclosed so that no moving parts are exposed to soil or elements.

D. Provide oil-tight and watertight actuator housings for valves, specifically designed for buried service or submerged service when located in valve vaults and factory packed with suitable grease.

E. Install valve position indicator on each actuator housing located above ground or in valve vaults. Valves shall be equipped with two inch (2 In) actuator nut only.

F. Indicate direction of opening of valve on exposed visible part of assembly and cast direction of open on two inch (2 In) nut on top of valve operator extension. Paint two inch (2 In) actuator nut and extension shaft black when counter-clockwise open.
G. Design worm-gear or traveling-nut actuators to be self-locking and designed to transmit twice the required actuator torque without damage to faces of gear teeth or contact faces of screw or nut.

2.4 VALVE BOXES
A. Provide Standard Type "A" valve boxes conforming to requirements of Section 02440 – Valve Boxes, Meter Boxes and Meter Vaults.

2.5 VALVE SERVICE MANHOLES
A. For large diameter water lines, provide manholes to dimensions shown on the Drawings conforming to requirements of Section 02305 – Precast Concrete Manholes.

PART III: EXECUTION

3.1 EARTHWORK
A. Conform to applicable provisions of Section 02125 – Excavation and Backfill for Utilities.

3.2 SETTING VALVES AND VALVE BOXES
A. Prior to Hydrostatic testing of water line and valve:
1. Test valve by opening and closing valve at a minimum of two (2) times to verify valve seats properly.
2. Verify number of turns from fully open to fully closed position is same as identified in manufacturer's submittal.
3. Adjust valve as required if number of turns do not match.
4. Remove foreign matter from within valves.
B. Install valves where shown on the Drawings or as located by the Project Manager. Use valve boxes for sixteen inch (16 In) and twenty-four inch (24 In) valves. Set valves plumb and as detailed. Center valve boxes on valves. Carefully tamp earth around each valve box for minimum radius of four feet (4 Ft) or to undisturbed trench face when less than four feet (4 Ft).
C. Avoid disturbing or overstressing valve body when installing valves. Perform field adjustment of valves under pressure to ensure shutoff occurs in number of rotations as described in valves operation and maintenance manual.
D. Attach two (2) – four feet (4 Ft) lengths of pipe to each side of valve prior to installation in line.
E. Submit certification that large diameter valve was installed, adjusted and exercised in accordance with manufacturer's instructions. Manufacturer's certification shall state that all performance

characteristics of large diameter valves, as installed, have been met. Adjustments made to valve, for any reason, must be made by manufacturer's representative.

3.3 DISINFECTION AND TESTING

A. The Contractor shall disinfect valves and appurtenances as required by Section 02455 – Disinfection of Waterlines and test as required by Section 02450 – Hydrostatic Testing of Waterlines. Do not use valves for throttling without prior approval of manufacturer.

3.4 COATING OF PIPING

A. Coat valves located in vaults, stations and above ground using approved paint. Minimum of two (2) coats shall be applied with minimum of three (3) mil thickness. Apply coating in accordance with manufacturer's recommendations.

END OF SECTION