Section 02541

WATER AND WASTEWATER LINE VALVES

1.0 G E N E R A L

1.01 SECTION INCLUDES

A Gate valves, Plug Valves, Butterfly Valves, Air Release and Pressure Reducing Valves.

B References to Technical Specifications:
1. Section 01200 – Measurement and Payment Procedures
2. Section 01350 - Submittal Procedures
3. Section 02520 – Valve Boxes, Meter Boxes, and Meter Vaults
4. Section 02542 – Concrete Manholes
5. Section 02318 – Excavation and Backfill for Utilities
6. Section 02510 – Water Mains

C Referenced Standards:
1. American Society for Testing and Materials (ASTM)
   a. ASTM A 307, "Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength"
   b. ASTM B 763, "Standard Specification for Copper Alloy Sand Casting for Valve Applications"
   c. ASTM B 62, "Standard Specification for Composition Bronze or Ounce Metal Castings"
   d. ASTM D 429, "Standard Test Methods for Rubber Property-Adhesion to Rigid Substrates"
   e. ASTM A 126, "Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings"
   f. ASTM A 48, "Standard Specification for Gray Iron Castings"
   g. ASTM A 240, "Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications"
   h. ASTM A 276, "Standard Specification for Stainless Steel Bars and Shapes"
   i. ASTM B 584, "Standard Specification for Copper Alloy Sand Castings for General Applications"
   j. ASTM A 313, "Standard Specification for Stainless Steel Spring Wire"
2. American Water Works Association (AWWA)
   a. AWWA C500 Gate Valves, 3 Through 48 in. NPS, for Water and Sewage Systems.
   b. AWWA C509 or AWWA C515 Resilient-seated Gate Valves, 3 through 12 NPS, for Water and Sewage Systems
   c. AWWA C550 Protective Epoxy Interior Coatings for Valves and Hydrants
   d. AWWA C504 Rubber-Sealed Butterfly Valves

3. American National Standards Institute (ANSI)

1.02 MEASUREMENT AND PAYMENT

A Unless indicated as a Bid Item, no separate payment will be made for valves under this Section. Include cost in Bid Items for water mains.

B Refer to Section 01200 – Measurement and Payment Procedures.

C Stipulated Price (Lump Sum). If the Contract is a Stipulated Price Contract, payment for work in this Section is included in the total Stipulated Price.

1.03 SUBMITTALS

A Make Submittals required by this Section under the provisions of Section 01350 – Submittals.

B Submit manufacturer's product data for proposed valves for approval.

1.04 QUALITY CONTROL

A Submit manufacturer's affidavit that gate valves are manufactured in the United States and conform to stated requirements of AWWA C500, AWWA C509 and AWWA C515 and this Section, and that they have been satisfactorily tested in the United States in accordance with AWWA C500, AWWA C509 and AWWA C515.

2.0 P R O D U C T S

2.01 GATE VALVES

A Gate Valves: AWWA C500, AWWA C509 or C515 and additional requirements of this Section. Direct bury valves and those in subsurface vaults, aboveground and plant valves open counterclockwise.

B If type of valve is not indicated on Plans, use gate valves as line valves for sizes less than 16-inches. If type of valve is indicated, no substitute is allowed.

C Gate Valves 1-1/2 Inches in Diameter and Smaller: 125 psig; bronze; rising-stem; single-wedge; disc type; screwed ends; such as Crane No. 428, or approved equal.

D Coatings for Gate Valves 2 Inches and Larger: AWWA C550; Indurall 3300 or approved equal, non-toxic, imparts no taste to water, functions as physical, chemical, and electrical barrier between base metal and surroundings, minimum 8-mil-thick, fusion-bonded epoxy. Prior to assembly of valve, apply protective coating to interior and exterior surfaces of body.

E Gate Valves 2 Inches in Diameter: Iron body, double gate, non-rising stem, 150-pound test, 2 inch square nut operating clockwise to open.

F Gate Valves 4 Inches to 12 Inches in Diameter: Non-directional, resilient seated (AWWA C509 or AWWA C515) or parallel seat double disc (AWWA C500), 200 psig, bronze mounting, push-on bell ends with rubber joint rings, and nut-operated unless otherwise specified. Provide resilient seated valves manufactured by American Darling AFC-500, US Pipe Metroseal 200, or approved equal. Provide double disc valves manufactured by American Darling 52, Clow F-6102, or approved equal. Comply with following requirements:

1. Design: Fully encapsulated rubber wedge or rubber seat ring mechanically attached with minimum 304 stainless-steel fasteners or screws; threaded connection isolated from water by compressed rubber around opening.
2. Body: Cast or ductile iron, flange bonnet and stuffing box together with ASTM A 307 Grade B bolts. Manufacturer's initials, pressure rating, and year manufactured shall be cast in body.
3. Bronze: Valve components in waterway to contain not more than 15 percent zinc and not more than 2 percent aluminum.
4. Stems: ASTM B 763 bronze, alloy number 995 minimum yield strength of 40,000 psi; minimum elongation in 2 inches of 12 percent, non-rising.
5. O-rings: AWWA C509, sections 2.2.6 and 4.8.2.
6. Stem Seals: Consist of three O-rings, two above and one below thrust collar with anti-friction washer located above thrust collar.
7. Stem Nut: Independent or integrally cast of ASTM B 62 bronze.
8. Resilient Wedge: Molded, synthetic rubber, vulcanized and bonded to cast or ductile iron wedge or attached with 304 stainless steel screws tested to meet or exceed ASTM D 429, Method B; seat against epoxy-coated surface in valve body.
9. Bolts: AWWA C509 Section 4.4; stainless steel; cadmium plated, or zinc coated.

G Gate Valves 16 Inches to 24 Inches in Diameter: AWWA C500 by Mueller; push-on bell ends with rubber rings and nut-operated unless otherwise specified, double disc, 150 psi, and comply with the following:

1. Body: Cast or ductile iron; flange together bonnet and stuffing box with ASTM A 307 Grade B bolts. Manufacturer's initials, pressure rating, and year manufactured shall be cast in body. Equip with rollers, tracks, and scrapers.
2. Stems: Machined from ASTM B 62 bronze rod with integral forged thrust collar machined to size; non-rising.
3. Stem Seals: Consist of one O-ring above and one O-ring below thrust collar with anti-friction washer located above thrust collar for operating torque.
4. Stem Nut: Independent or integrally cast of ASTM B 62 bronze.
5. Discs: Cast iron with bronze disc rings securely peened into machined dovetailed grooves.
6. Wedging Device: Solid bronze or cast-iron, bronze-mounted wedges. Thin plates or shapes integrally cast into cast-iron surfaces are acceptable. Other moving surfaces integral to wedging action shall be bronze monel or nickel alloy-to-iron.

7. Bronze Mounting: Built as integral unit mounted over, or supported on, cast iron base and of sufficient dimensions to be structurally sound and adequate for imposed forces.
8. Gear Cases: Cast iron; furnished on 18-inch and larger valves and of extended type with steel side plates, lubricated, gear case enclosed with oil seal or O-rings at shaft openings.
9. Stuffing Boxes: Located on top of bonnet and outside gear case.

H Gate Valves 20 Inches and Larger: Furnish and equip with bypass valves.
1. Sizes: Provide 3-inch bypass valves for 16-inch through 20 inch gate valves. Provide 4-inch bypass valves for 24-inch gate valves.

I Valves 4 Inches through 12 Inches for Installation in Vertical Pipe Lines:
1. Double disc, square bottom.

J Valves 14 Inches and Larger for Installation in Horizontal Pipe Lines:
1. Equipped with bronze shoes and slides.

K Gate Valves Installed at Greater than 4 foot Depth:
1. Provide non-rising, extension stem having coupling sufficient to attach securely to operating nut of valve. Upper end of extension stem shall terminate in square wrench nut no deeper than 4 feet from finished grade.

L Gate Valves in Factory Mutual (Fire Service) Type Meter Installations:
1. Conform to provisions of this specification; outside screw and yoke valves; carry label of Underwriters' Laboratories, Inc.; flanged, Class 125; clockwise to close.

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

2.02 BUTTERFLY VALVES AND ACTUATORS

A Butterfly Valves and Actuators: Conform to AWWA C504, except as modified or supplemented herein. Provide valves manufactured by Keystone International, American-Darling, or approved equal.

B If type of valve is not indicated on Plans, butterfly valves shall be used for line valve sizes 16 inch and larger. If type of valve is specified, no substitute will be allowed.

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

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

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

F Butterfly Valves and Actuators (Additional Requirements for Large-Diameter Water Mains): Valves larger than 72 inches in diameter shall have all components designed

so that the allowable stresses at rated pressure shall not exceed one-third of the yield strength or one-fifth of the ultimate strength of the material used. Provide valves manufactured by Keystone International, American-Darling, or equal.

2.03 BUTTERFLY VALVE CONSTRUCTION

A Valves: AWWA C504, Class 150B. Body: Cast iron, ASTM A 126, Class B. Flanges: ANSI B 16.1, Class 125 lb.

B Discs for Butterfly Valves: Either cast iron or ductile iron.

C Seats: Buna-N or neoprene, and may be applied to disc or body. Seats shall be mechanically secured and may 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 will not be allowed.

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 two coats of two-component, high-build epoxy with minimum dry thickness of 10 mils. Epoxy coating: Indurall 3300 or approved equal. Coatings shall be holiday tested and measured for thickness.

E Valve shaft and keys, dowel pins, or taper pins used for attaching valve shaft to valve disc: Type-304 or 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.

F Packing: Field-adjustable, split-V type, and replaceable without removing operator 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 90 degrees to the pipe axis and shall rotate 90 degrees 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 Plans.

2.04 BUTTERFLY VALVE ACTUATOR CONSTRUCTION

A Provide actuators for valves with size based on line velocity of 16 feet per second, and, unless otherwise shown on Plans, equip with geared manual actuators. Provide

fully enclosed and traveling-nut type, rack-and-pinion type, or worm-gear type for valves 24 inches and smaller.

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

C Provide valve shaft extended from valve to 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 a valve position indicator on each actuator housing located above ground or in valve vaults. Valves shall be equipped with 2-inch actuator nut only.

F Indicate direction of opening of valve on exposed visible part of assembly.

G Design worm-gear or traveling-nut actuators so that a torque of 150 foot-pounds, or less, will operate valve at most adverse condition for which valve is designed. Vertical axis of actuating nut shall not move as valve is opened or closed.

2.05 VALVE BOXES

A Provide standard adjustable valve boxes only conforming to requirements of Section 02520 – Valve Boxes, Meter Boxes, and Meter Vaults.

2.06 VALVE SERVICE MANHOLES

A For large-diameter water mains, provide manholes to dimensions shown on Plans conforming to requirements of Section 02542 – Concrete Manholes.

2.07 AIR RELEASE AND VACUUM RELIEF VALVES

A Air Release Valves: Apco No. 200, GA Industries Fig. 2-AR, or equal. Materials: body and cover, ASTM A 48, Class 30, cast iron; float and leverage mechanism, ASTM A 240 or A276 stainless steel; orifice and seat, stainless steel against Buna-N or Viton mechanically retained with hex head nut and bolt; other valve internals, stainless steel or bronze. Provide inlet and outlet connections, and orifice as shown on Plans.

B Air Release and Vacuum Valves: Provide single-body, standard combination or duplex-body custom combination valves as indicated on Plans.

1. For 2 inch and 3 inch, single-body valves, provide inlet and outlet sizes as shown on Plans and orifice sized for 100 psi working pressure. Valve materials: body, cover and baffle, ASTM A 48, Class 35, or ASTM A 126, Grade B cast iron; plug or poppet, ASTM A 276 stainless steel; float, ASTM A 240 stainless steel; seat, Buna-N; other valve internals, stainless steel. Valve exterior: Painted with shop-applied primer suitable for contact with potable

water. Provide Apco Model 145C or 147C, Val-Matic Series 200, or equal valves.

2. For 3 inch and larger duplex body valves as shown on Plans, provide Apco Series 1700 with No. 200 air release valve, GA Industries Fig. No. AR/GH-21K/280, or equal. Air and vacuum valve materials: body and cover, ASTM A 48, Class 35, cast iron; float, ASTM A 240 stainless steel; seat, Type-304, stainless steel and Buna-N; other valve internals, stainless steel or bronze. Air release valve: Constructed as specified in paragraph above on Air Release Valves.

C Vacuum Relief Valves: Provide air inlet vacuum relief valves with flanged inlet and outlet connections as shown on Plans. Provide air release valves in combination with inlet and outlet, and orifice as shown on Plans. Valve shall open under pressure differential not to exceed 0.25 psi. Provide Apco Series 1500 with a No. 200A air release valve, GA Industries Fig. No. HCARV, or approved equal. Materials for vacuum relief valves: valve body, ASTM A 48, Class 35, cast iron; seat and plug, ASTM B 584 bronze, copper alloy 836; spring, ASTM A 313, Type-304, stainless steel; bushing, ASTM B 584 bronze, copper alloy 932; retaining screws, ASTM A 276, Type-304, stainless steel.

D Air Release Valve Vault as detailed in Plans.

2.08 PRESSURE REDUCING VALVES

A Provide Cla-Val Model 90-01, or approved equal, PRV with strainer in location and arrangement as shown on Plans. Valve body: ASTM A 48, cast iron or ASTM A 126, Class B, cast iron with ANSI B16.1, Class 125, flanges. Valve cover: ASTM A 48 cast iron. Valve internals: Type-303, stainless steel or B-62 bronze. Rubber parts: Buna-N. No leather parts shall be allowed. Resilient seat shall have rectangular cross section.

B Control Tubing: Contain shutoff cocks with "Y" strainer.

C PRV: Equip with valve position indicator. Initially set in field by authorized manufacturer's representative with 60 psi downstream pressure.

D Provide basket strainer upstream of PRV as shown on Plans. Strainer body: quick-opening type, fabricated-steel construction with ANSI B16.1, Class 150, flanges. Basket: Type-304, stainless steel. Provide Hayward Model 90, or equal, for PRV 4-inch through 24-inch. Provide Hayward Model 510, or equal, for PRV 14 inches or greater when space limitations dictate the use of smaller strainer housing.

E Pilot Systems for PRV: Adjustable and pressure sustaining.

F Valve Box: Valve Box conforming to requirements of Section 02520 – Valve Boxes, Meter boxes, and Meter Vaults.

3.0 E X E C U T I O N

3.01 INSTALLATION

A Earthwork. Conform to applicable provisions of Section 02318 – Excavation and Backfill for Utilities.

B Operation. Do not use valves for throttling without prior approval of manufacturer.

3.02 SETTING VALVES AND VALVE BOXES

A Remove foreign matter from within valves prior to installation. Inspect valves in open and closed positions to verify that parts are in satisfactory working condition.

B Install valves and valve boxes where shown on Plans. Set valves plumb and as detailed. Center valve boxes on valves. Carefully tamp earth around each valve box for minimum radius of 4 feet, or to undisturbed trench face if less than 4 feet. Install valves completely closed when placed in water line.

C For pipe section of each valve box, use only cast iron, ductile iron, or DR18 PVC pipe cut to proper length. Size to allow future operation of valve. Assemble and brace box in vertical position as indicated on Plans.

3.03 DISINFECTION AND TESTING

A Perform disinfection and testing of valves and appurtenances as required by Section 02510 – Water Mains.

B Repair or replace valves which exceed the allowable specified leakage rate.

3.04 PAINTING OF VALVES

A Paint valves in vaults, stations, and above ground using ACRO Paint No. 2215, or approved equal.

END OF SECTION