



## ENGINEERING CLARIFICATION

**EC TITLE:** Process Valves and Operators Specification  
**PROJECT:** 3 Kings Water Treatment Plant

**EC NO.:** 33  
**DATE:** 7/9/2020  
**STATUS:** Acknowledged

### SECTION 1: BY CONTRACTOR

**QUESTION:**

Clarification required for Process Valves and Operators specification as a result of RFI 72 and Submittal 40 27 02 - 1.

**DRAWING NO.:**  
**SPECIFICATION SECTION:** 40 27 02 Process Valves and Operators

**POTENTIAL COST IMPACT:**  
**POTENTIAL SCHEDULE IMPACT:**

**PROPOSED SOLUTION:**

See attached revisions to specification.

**COMMENTS:**

**INITIATOR:** Zalla, Joseph/SLC

**PRIORITY:** Normal  
**REQUESTED RESPONSE DATE:** 7/23/2020

### SECTION 2: BY REVIEWER

**RESPONSE:**

**COMMENTS:**

**REVIEWED BY:** Sam Conant

**REVIEWED DATE:** 7/20/2020

**SECTION 40 27 02**  
**PROCESS VALVES AND OPERATORS**

**PART 1 GENERAL**

1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
1. American Gas Association (AGA): 3, Orifice Metering of Natural Gas and Other Related Hydrocarbon Fluids.
  2. American National Standards Institute (ANSI): Z21.15, Manually Operated Gas Valves for Appliances, Appliance Connector Valves and Hose End Valves.
  3. American Society of Mechanical Engineers (ASME):
    - a. B16.1, Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.
    - b. B16.44, Manually Operated Metallic Gas Valves for Use in Above Ground Piping Systems up to 5 psi.
  4. American Society of Sanitary Engineers (ASSE): 1011, Performance Requirements for Hose Connection Vacuum Breakers.
  5. American Water Works Association (AWWA):
    - a. C111/A21.11, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
    - b. C500, Metal-Seated Gate Valves for Water Supply Service.
    - c. C504, Rubber-Seated Butterfly Valves, 3 In. (75 mm) Through 72 In. (1,800 mm).
    - d. C508, Swing-Check Valves for Waterworks Service, 2-In. Through 24-In. (50-mm Through 600-mm) NPS.
    - e. C509, Resilient-Seated Gate Valves for Water Supply Service.
    - f. C510, Double Check Valve Backflow Prevention Assembly.
    - g. C511, Reduced-Pressure Principle Backflow Prevention Assembly.
    - h. C512, Air-Release, Air/Vacuum, and Combination Air Valves for Waterworks Service.
    - i. C515, Reduced-Wall, Resilient-Seated Gate Valves for Water Supply Service.
    - j. C541, Hydraulic and Pneumatic Cylinder and Vane-Type Actuators for Valves and Slide Gates.
    - k. C542, Electric Motor Actuators for Valves and Slide Gates.
    - l. C550, Protective Interior Coatings for Valves and Hydrants.
    - m. C606, Grooved and Shouldered Joints.
    - n. C800, Underground Service Line Valves and Fittings.

6. ASTM International (ASTM):
  - a. A276, Standard Specification for Stainless Steel Bars and Shapes.
  - b. A351/A351M, Standard Specification for Castings, Austenitic, for Pressure-Containing Parts.
  - c. A380, Standard Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems.
  - d. A564/A564M, Standard Specification for Hot-Rolled and Cold-Finished Age-Hardening Stainless Steel Bars and Shapes.
  - e. B61, Standard Specification for Steam or Valve Bronze Castings.
  - f. B62, Standard Specification for Composition Bronze or Ounce Metal Castings.
  - g. B98/B98M, Standard Specification for Copper-Silicon Alloy Rod, Bar, and Shapes.
  - h. B127, Standard Specification for Nickel-Copper Alloy (UNS N04400) Plate, Sheet, and Strip.
  - i. B139/B139, Standard Specification for Phosphor Bronze Rod, Bar and Shapes.
  - j. B164, Standard Specification for Nickel-Copper Alloy Rod, Bar, and Wire.
  - k. B194, Standard Specification for Copper-Beryllium Alloy Plate, Sheet, Strip, and Rolled Bar.
  - l. B584, Standard Specification for Copper Alloy Sand Castings for General Applications.
  - m. D429, Standard Test Methods for Rubber Property-Adhesion to Rigid Substrates.
  - n. D1784, Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.
7. Canadian Standards Association, Inc. (CSA): 9.1, Manually Operated Gas Valves for Appliances, Appliance Connector Valves and Hose End Valves.
8. Chlorine Institute (CI): Pamphlet 6, Piping Systems for Dry Chlorine.
9. FM Global (FM).
10. Food and Drug Administration (FDA).
11. International Association of Plumbing and Mechanical Officials (IAPMO).
12. Manufacturers Standardization Society (MSS):
  - a. SP-80, Bronze Gate, Globe, Angle, and Check Valves.
  - b. SP-81, Stainless Steel, Bonnetless, Flanged Knife Gate Valves.
  - c. SP-85, Gray Iron Globe and Angle Valves, Flanged and Threaded Ends.
  - d. SP-88, Diaphragm Valves.
  - e. SP-110, Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

13. National Electrical Manufacturers Association (NEMA): 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
14. NSF International (NSF):
  - a. NSF/ANSI 61, Drinking Water System Components - Health Effects.
  - b. NSF/ANSI 372, Drinking Water System Components - Lead Content.
15. Underwriters Laboratories (UL).
16. USC Foundation for Cross-Connection Control and Hydraulic Research.

## 1.02 SUBMITTALS

### A. Action Submittals:

1. Shop Drawings:
  - a. Product data sheets for each make and model. Indicate valve Type Number, applicable Tag Number, and facility name/number or service where used.
  - b. Complete catalog information, descriptive literature, specifications, and identification of materials of construction.
  - c. Certification for compliance to NSF/ANSI 61 for valves used for drinking water service.
  - d. Power and control wiring diagrams, including terminals and numbers.
  - e. For each power actuator provided, manufacturer's standard data sheet, with application specific features and options clearly identified.
  - f. Sizing calculations for open-close/throttle and modulating valves.
  - g. Anchorage and bracing drawings and cut sheets, as required by Section 01 88 15, Anchorage and Bracing.

### B. Informational Submittals:

1. Anchorage and bracing calculations as required by Section 01 88 15, Anchorage and Bracing.
2. Manufacturer's Certificate of Compliance, in accordance with Section 01 61 00, Common Product Requirements, for:
  - a. Electric actuators; full compliance with AWWA C542.
  - b. Butterfly valves; full compliance with AWWA C504.
3. Tests and inspection data.
4. Operation and Maintenance Data as specified in Section 01 78 23, Operation and Maintenance Data.
5. Manufacturer's Certificate of Proper Installation, in accordance with Section 01 43 33, Manufacturers' Field Services.

**PART 2 PRODUCTS**

## 2.01 GENERAL

- A. Valves to include operator, actuator, handwheel, chain wheel, extension stem, floor stand, operating nut, chain, wrench, and accessories to allow a complete operation from the intended operating level.
- B. Valve to be suitable for intended service. Renewable parts not to be of a lower quality than specified.
- C. Valve same size as adjoining pipe, unless otherwise called out on Drawings or in Supplements.
- D. Valve ends to suit adjacent piping.
- E. Resilient seated valves shall have no leakage (drip-tight) in either direction at valve rated design pressure. All other valves shall have no leakage (drip-tight) in either direction at valve rated design pressure, unless otherwise allowed for in this section or in stated valve standard.
- F. Size operators and actuators to operate valve for full range of pressures and velocities.
- G. Valve to open by turning counterclockwise, unless otherwise specified.
- H. Factory mount operator, actuator, and accessories.
- I. Components and Materials in Contact with Water for Human Consumption: Comply with the requirements of the Safe Drinking Water Act and other applicable federal, state, and local requirements. Provide certification by manufacturer or an accredited certification organization recognized by the Authority Having Jurisdiction that components and materials comply with the maximum lead content standard in accordance with NSF/ANSI 61 and NSF/ANSI 372.

## 2.02 SCHEDULE

- A. Additional requirements relative to this section are shown on Electric Actuated Valve Schedule, Self-Regulated Valve Schedule, and Manual Valve Schedule located at the end of this section.
- B. The Manual Valve Schedule includes manual valves 4 inches and greater. For manual valves smaller than 4 inches in size, valve size and type are called out on the Drawings.

## 3KINGS WTP PHASE III DESIGN

### 2.03 MATERIALS

- A. Bronze and brass valve components and accessories that have surfaces in contact with water to be alloys containing less than 16 percent zinc and 2 percent aluminum.
  - 1. Approved alloys are of the following ASTM designations: B61, B62, B98/B98M (Alloy UNS No. C65100, C65500, or C66100), B139/B139M (Alloy UNS No. C51000), B584 (Alloy UNS No. C90300 or C94700), B164, B194, and B127.
  - 2. Stainless steel Alloy 18-8 may be substituted for bronze.
- B. Valve materials in contact with or intended for drinking water service to meet the following requirements:
  - 1. Materials to comply with requirements of the Safe Drinking Water Act and other applicable federal, state, and local requirements.
  - 2. Coatings materials to be formulated from materials deemed acceptable to NSF/ANSI 61.
  - 3. Supply certification product is certified as suitable for contact with drinking water by an accredited certification organization in accordance with NSF/ANSI 61. Provide certification for each valve type used for drinking water service.

### 2.04 FACTORY FINISHING

- A. General:
  - 1. Interior coatings for valves and hydrants shall be in accordance with AWWA C550, unless otherwise specified.
  - 2. Exterior coating for valves and hydrants shall be in accordance with Section 09 90 00, Painting and Coating.
  - 3. Material in contact with potable water shall conform to NSF/ANSI 61.
  - 4. Exposed safety isolation valves and lockout valves with handles, handwheels, or chain wheels shall be “safety yellow.”
- B. Where epoxy lining and coating are specified, factory finishing shall be as follows:
  - 1. In accordance with AWWA C550.
  - 2. Either two-part liquid material or heat-activated (fusion) material except only heat-activated material if specified as “fusion” or “fusion bonded” epoxy.
  - 3. Minimum 7-mil dry film thickness except where limited by valve operating tolerances.

## 2.05 VALVES

## A. Gate Valves:

1. General:
  - a. AWWA gate valves to be in full compliance with stated AWWA standard and the following requirements:
    - 1) Provide 2-inch operating nut and handwheel for AWWA gate valves 12 inches and smaller.
    - 2) Provide totally enclosed spur or bevel gear operator with indicator for AWWA gate valves 14 inches and larger.
    - 3) Provide Affidavit of Compliance per the applicable AWWA standard for AWWA gate valves.
    - 4) Mark AWWA gate valves with manufacturer's name or mark, year of valve casting, valve size, and working water pressure.
    - 5) Repaired AWWA gate valves shall not be submitted or supplied.
2. Type V132 Resilient Seated Gate Valve 3 Inches to 12 Inches, for Buried Service:
  - a. Iron body, resilient seat, bronze stem and stem nut, mechanical joint ends, nonrising stem, in accordance with AWWA C509, 2-inch operating nut, minimum design working water pressure 250 psig, full port, fusion epoxy coated inside and outside per AWWA C550.
  - b. Manufacturers and Products:
    - 1) M&H Valve; AWWA C509.
    - 2) U.S. Pipe; A-USPO.
    - 3) "Or-equal."
3. Type V134 Resilient Seated Ductile Iron Gate Valve 3 Inches to 36 Inches:
  - a. Ductile iron body, resilient seat, bronze stem and stem nut, ASME B16.1 Class 125 flanged ends, nonrising stem, in accordance with AWWA C515, minimum design working water pressure 250 psig, full port, fusion epoxy coated inside and outside per AWWA C550.
  - b. Manufacturers and Products:
    - 1) American Flow Control; Series 2500.
    - 2) M&H; Style 7000 and C515 Large RW Valves.
    - 3) "Or-equal."
4. Type V135 Resilient Seated Ductile Iron Gate Valve 3 Inches to 12 Inches:
  - a. Ductile iron body (ASTM A536), resilient seat, bronze stem and stem nut, ASME B16.1 Class 250 flanged ends, nonrising stem, in accordance with AWWA C515, minimum design working water

pressure 350 psig, full port, fusion epoxy coated inside and outside per AWWA C550, NSF/ANSI 61 certified.

- b. Manufacturers and Products:
  - 1) American Flow Control; Series 3500.
  - 2) Mueller Co.; A2361.
  - 3) "Or-equal."

B. Globe Valves:

- 1. Type V235 Angle Type Hose Valve 3/4 Inch:
  - a. 3/4-inch NPT female inlet, 3/4-inch male hose thread outlet, heavy rough brass body rated 125 psi, lockshield bonnet, removable handle, atmospheric vacuum breaker conforming to ASSE 1011 and IAPMO code.
  - b. Manufacturers and Products:
    - 1) Acorn; 8126, surface pipe mount valve, bent nose without flange.
    - 2) Acorn; 8121, surface mount through wall valve, bent nose with flange.
    - 3) Acorn; 8131, pipe and pedestal mounted valve located above 6 inches, straightnose.
    - 4) Acorn; 8136, pedestal mounted valve located lower than 6 inches, inverted nose.
    - 5) "Or-equal."
- 2. Type V237 Angle Pattern Hose Valve 1 Inch to 2 Inches:
  - a. All-bronze, NPT threaded ends, inside screw-type rising stem, TFE disc, cast brass male NPT by male NHT adapter with hexagonal center wrench nut, brass cap with chain, complies with MSS SP-80, rated 300 WOG.
  - b. Manufacturers and Products:
    - 1) Stockham; Figure B-222T.
    - 2) Crane Co.; Cat. No. 17TF.
    - 3) Nibco; Figure T-335-Y.

C. Ball Valves:

- 1. Type V302 Actuator Ready Ball Valve 2 Inches and Smaller for General Water and Air Service:
  - a. Two-piece, standard port, NPT threaded ends, bronze body and end piece, actuator mounting pad, Type 316 stainless steel ball and stem, vented ball, reinforced PTFE seats and seals, adjustable packing nut, blowout-proof stem, rated 600-pound WOG, 150-pound SWP, complies with MSS SP-110.
  - b. Manufacturers and Products:
    - 1) Conbraco Apollo; 71-140.



- 2) Milwaukee; 20BSOR-02.
- 3) "Or-equal."
- 2. Type V303 Ball Valve 2 Inches and Smaller for Equipment Air System Shutoff:
  - a. Two-piece, NPT threaded ends, bronze body and end piece, hard chrome-plated solid bronze or brass ball, RTFE seats and packing, blowout-proof stem, adjustable packing gland, 125 psig rated, safety exhaust port to exhaust downstream side when valve is in closed position, zinc-coated steel locking handle with vinyl grip.
  - b. Meets OSHA Regulation 29 CFR Part 1910.147 requirements.
  - c. Manufacturers and Products:
    - 1) Conbraco Apollo; 75-100-41.
    - 2) Nibco; T-580-70-SV/T-585-70-SV.
    - 3) "Or-equal."
- 3. Type V305 Ball Valve 2 Inches and Smaller for Natural Gas Service:
  - a. Two-piece bronze or forged brass body and end piece, NPT threaded ends, hard chrome-plated solid brass ball, RTFE seats and seal, blowout-proof stem, zinc-plated hand lever operator with vinyl grip, UL Listed Guide YRPV for natural/manufactured gas, 600 WOG.
  - b. Manufacturers and Products:
    - 1) Conbraco Apollo; 80-100.
    - 2) Nibco; T-585-70-UL/T-580-70-UL.
    - 3) "Or-equal."
- 4. Type V307 Stainless Steel Ball Valve 2 Inches and Smaller:
  - a. Three-piece, full port, ASTM A276 GR 316 or ASTM A351/A351M GR CF8M stainless steel body and end pieces, Type 316 stainless steel ball, NPT threaded ends, reinforced PTFE seats, seals, and packing, adjustable packing gland, blowout-proof stainless steel stem, stainless steel lever operator with vinyl grip, rated 800 psig to 1,000 psig CWP, complies with MSS SP-110.
  - b. Manufacturers and Products:
    - 1) Conbraco Apollo; 86R-100/86-500 Series.
    - 2) Nibco; T-595-S6-R-66-LL.
    - 3) "Or-equal."
- 5. Type V308 Stainless Steel Ball Valve 2 Inches and Smaller:
  - a. Two-piece, standard port, NPT threaded ends, ASTM A351/A351M GR CF8M stainless steel body and end pieces, actuator mounting pad, Type 316 stainless steel ball and stem, vented ball, reinforced PTFE seats and seals, adjustable packing nut, blowout-proof stem, rated 1,500 psig WOG minimum, 150 psi SWP, complies with MSS SP-110.

- b. Manufacturers and Products:
  - 1) Conbraco Apollo; 76-100.
  - 2) Nibco; T-580-S6-R-66-LL.
  - 3) Milwaukee; 20SSOR-02.
- 6. Type V309 Instrument Air Shutoff Valve 1/8 Inch to 3/4 Inch:
  - a. Stainless steel body ball valve, nylon handle, tube fitting ends, PTFE seats and seals, panel nut, rated 1,500 psi minimum.
  - b. Manufacturers and Products:
    - 1) Swagelok; 40 Series.
    - 2) Parker Hannifin; B Series.
    - 3) "Or-equal."
- 7. Type V330 PVC Ball Valve 2 Inches and Smaller:
  - a. Rated 150 psi at 73 degrees F, with ASTM D1784, Type I, Grade 1 polyvinyl chloride body, ball, and stem, end entry, double union design, solvent-weld socket ends, elastomer seat, Viton or Teflon O-ring stem seals, to block flow in both directions. Provide pressure relief hole drilled on low pressure side of ball for Sodium Hypochlorite Service.
  - b. Manufacturers and Products:
    - 1) Nibco; Chemtrol Tru-Bloc.
    - 2) ASAHI/America; Type 21.
    - 3) Spears; True Union.
- 8. Type V331 PVC Ball Valve 3 Inches and 4 Inches:
  - a. Rated 150 psi at 73 degrees F, with ASTM D1784 Type I, Grade 1 PVC full port body, Teflon seat, Viton O-ring stem, face and carrier seals, end entry design with dual union, solvent-weld socket ends, or single union ball valve with flanged ends drilled to ASME B16.1. Provide pressure relief hole drilled on low pressure side of ball for Sodium Hypochlorite Service.
  - b. Manufacturers and Products:
    - 1) Nibco; Chemtrol Tru-Bloc.
    - 2) ASAHI/America; Type 21.
    - 3) "Or-equal."
- 9. Type V332 PVC Three-Way Ball Valve 1/2 Inch to 6 Inches:
  - a. Rated 150 psi at 70 degrees F, with ASTM D1784 Type I, Grade 1 PVC full port body, Teflon seat, double O-ring stem seal, FPM or EPDM O-ring stem, face and carrier seals, end entry design with dual union, solvent-weld socket ends, or single union ball valve with flanged ends drilled to ASME B16.1. 90-degree three-way ball valve used for electrically actuated valves, standard three-way ball valve used for manually actuated valves.
  - b. Manufacturers and Products:
    - 1) Hayward; LA Series Lateral Three-Way True Union.

10. Type V335 CPVC Ball Valve 2 Inches and Smaller:
  - a. Rated 150 psi at 100 degrees F, 80 psi at 140 degrees, with ASTM D1784, Type IV, Grade 1 chlorinated polyvinyl chloride (CPVC) body, ball, and stem, end entry, double union design, with solvent-weld socket ends or single union ball with flanged ends drilled to ASME B16.1, replaceable Teflon seat, Viton or Teflon O-ring stem seals, to block flow in both directions. Provide pressure relief hole drilled on low pressure side of ball for Sodium Hypochlorite Service.
  - b. Manufacturers and Products:
    - 1) Nibco; Chemtrol Tru-Bloc.
    - 2) ASAHI/America; Type 21.
    - 3) Spears; True Union.
11. Type V336 Stainless Steel Three-Way Ball Valve 1/4 Inch to 2 Inches:
  - a. Three-way valve, single reduced port, ASTM A351/A351M GR CF8M stainless steel body and end pieces, ASTM A351/A351M GR CF8M or Type 316 stainless steel ball, NPT threaded ends, reinforced PTFE seats, seals, and packing, adjustable packing gland, blowout-proof stainless steel stem, stainless steel lever operator with vinyl grip, rated 800 psig to 1,000 psig CWP, complies with MSS SP-110.
  - b. Manufacturers and Products:
    - 1) Apollo; 76-600 Series.
    - 2) Milwaukee Valve; BA3WDSLH.
    - 3) "Or-equal."
12. Type V337 PVDF Ball Valve 2 Inches and Smaller:
  - a. Rated 150 psi at 73 degrees F, with ASTM D3222 Type 1, Grade 2 or Type II PVDF body, ball, and stem, end entry, double union design, fusion-welded socket ends, replaceable PTFE seat, and Viton or Teflon O-ring stem seals to block flow in both directions.
  - b. Manufacturers and Products:
    - 1) Nibco; Chemtrol Tru-bloc.
    - 2) ASAHI/America; Type 21.
    - 3) Hayward; HRS Series.

#### D. Plug Valves:

1. Type V405 Eccentric Plug Valve 3 Inches to 12 Inches:
  - a. Nonlubricated type rated 175 psig CWP, drip-tight shutoff with pressure from either direction, cast-iron body, exposed service flanged ends per ASME B16.1 or grooved ends in accordance with AWWA C606 for rigid joints, buried service mechanical joint ends, unless otherwise shown.

- b. Plug cast iron with round or rectangular port of no less than 80 percent of connecting pipe area and coated with Buna-N, seats welded nickel, stem bearings lubricated stainless steel or bronze, stem seal multiple V-rings, or U-cups with O-rings of nitrile rubber, grit seals on both upper and lower bearings.
- c. For buried service, provide external epoxy coating.
- d. Operators:
  - 1) 3-Inch to 4-Inch Valves: Wrench lever manual.
  - 2) 6-Inch to 12-Inch Valves: Totally enclosed, geared, manual operator with handwheel, 2-inch nut or chain wheel. Size operator for 1.5 times maximum operating shutoff pressure differential for direct and reverse pressure, whichever is higher. For buried service, provide completely sealed operator filled with heavy lubricant and 2-inch nut.
- e. Manufacturers and Products:
  - 1) Pratt; Ballcentric.
  - 2) DeZurik; Style PEC.
  - 3) Milliken; Millcentric Series 600.

E. Butterfly Valves:

- 1. General:
  - a. In full compliance with AWWA C504 and following requirements:
    - 1) Suitable for throttling operations and infrequent operation after periods of inactivity.
    - 2) Elastomer seats which are bonded or vulcanized to the body shall have adhesive integrity of bond between seat and body assured by testing, with minimum 75-pound pull in accordance with ASTM D429, Method B.
    - 3) Bubble-tight with rated pressure applied from either side. Test valves with pressure applied in both directions.
    - 4) No travel stops for disc on interior of body.
    - 5) Self-adjusting V-type or O-ring shaft seals.
    - 6) Isolate metal-to-metal thrust bearing surfaces from flowstream.
    - 7) Provide traveling nut or worm gear actuator with handwheel. Valve actuators to meet the requirements of AWWA C504.
    - 8) Buried service operators shall withstand 450 foot-pounds of input torque at fully open and fully closed positions.
    - 9) For submerged service valves, the external surfaces shall be prepared and coated in the same manner as the internal surfaces.

- 10) Provide linings and coatings per AWWA, unless otherwise indicated on Drawings or specified herein.
- 11) Valves to be in full compliance with NSF/ANSI 61. Provide NSF/ANSI 61 certificate for each valve.
- b. Non-AWWA butterfly valves to meet the following actuator requirements:
  - 1) For above ground installations, provide handle and notch plate for valves 6 inches and smaller and heavy-duty, totally enclosed gearbox type operators with handwheel, position indicator and travel stops for valves 8 inches and larger, unless otherwise indicated on Drawings or specified herein.
2. Type V500 Butterfly Valve Water Works Service 3 Inches to 20 Inches:
  - a. AWWA C504, Class 150B.
  - b. Short body type, flanged ends.
  - c. Cast-iron body, cast or ductile iron disc, Type 304 stainless steel shafts, EPDM rubber seat bonded or molded in body only, and stainless steel seating surface.
  - d. Provide epoxy lining and coating in compliance with AWWA C550. For submerged service, external surfaces shall be prepared and coated in the same manner as the internal surfaces.
  - e. Manufacturers and Products:
    - 1) Pratt; Model 2FII.
    - 2) DeZurik; BAW.
    - 3) "Or-equal."
3. Type V501 Butterfly Valve General Service 3 Inches to 20 Inches:
  - a. AWWA C504, Class 150B.
  - b. Wafer style type.
  - c. Buna N rubber seat.
  - d. Manufacturers and Products:
    - 1) Pratt; Model MKII.
    - 2) DeZurik; BOS-US.
    - 3) "Or-equal."
4. Type V502 Butterfly Valve General Service 3 Inches to 20 Inches:
  - a. AWWA C504, Class 150B.
  - b. Lugged-wafer style type.
  - c. Buna-N rubber seat.
  - d. Manufacturers and Products:
    - 1) DeZurik; BOS-US.
    - 2) "Or-equal."
5. Type V504 Butterfly Valve General Service 4 Inches to 48 Inches:
  - a. AWWA C504, Class 150B.
  - b. Flanged joint end type.
  - c. Cast-iron body, cast or ductile iron disc, Type 304 stainless steel shafts, EPDM rubber seat bonded or molded in body only, and stainless steel seating surface.

- d. Provide epoxy lining and coating in compliance with AWWA C550.
- e. Manufacturers and Products:
  - 1) Mueller; Linesal XPII, 5227 Series.
  - 2) Clow; Model 4500.
  - 3) "Or-equal."
- 6. Type V510 Lug Style Butterfly Valve, Resilient Seated, 2 Inches to 20 Inches for Low Pressure Process Air Service:
  - a. Lug style cast-iron body, aluminum bronze discs, Type 316 stainless steel one-piece stem, self-lubricating sleeve type bushings, EPDM replaceable resilient seat suitable for operating temperatures up to 250 degrees F, 150 psi working pressure rating, bubble-tight at 50 psi differential pressure, valve body to fit between ASME B16.1 Class 125/150 flanges.
  - b. Manufacturers and Products:
    - 1) Bray Controls; Series 31.
    - 2) Tyco/Keystone; Model AR2.
    - 3) "Or-equal."
- 7. Type V514 High Performance Butterfly Valve 2 Inches to 36 Inches:
  - a. ASME/ANSI B16.5 Class 300 lug style, high performance type in accordance with AWWA C519, carbon steel body, Type 316 stainless steel single or double offset disc, Type 316 stainless steel shaft and taper pins, EPDM seat, PTFE stem packing, stainless steel with RTFE thrust washer.
  - b. Manufacturers and Products:
    - 1) Tyco/Keystone; K-Lok Series.
    - 2) DeZurik; BHP Series.
    - 3) "Or-equal."
- 8. Type 520 Solid Polyvinyl Chloride Butterfly Valve 1-1/2 inches to 8 inches:
  - a. Wafer body type, pressure rated 150 psi at 70 degrees F CWP, solid ASTM D1784, Type I, Grade 1, PVC body and contoured PVC or polypropylene valve disc, stainless steel valve stem, Viton seat, lever operator.
  - b. Manufacturers and Products:
    - 1) ASAHI/America; Type 57.
    - 2) Spears Butterfly Valve.
    - 3) "Or-equal."

F. Check and Flap Valves:

- 1. Type V608 Swing Check Valve 2 Inches to 24 Inches:
  - a. AWWA C508, 125-pound flanged ends, cast-iron body, bronze body seat, bronze mounted cast-iron clapper with rubber facing, stainless steel hinge shaft.

- b. Valves, 2 inches through 12 inches rated 175-pound WWP and 14 inches through 24 inches rated 150-pound WWP. Valves to be fitted with adjustable outside lever and weight. Increasing-pattern body valve may be used where increased outlet piping size is shown.
- c. Manufacturers and Products:
  - 1) M&H Valve; Style 59, 159, or 259.
  - 2) Mueller Co.; No. A-2600 Series.
  - 3) "Or-equal."
- 2. Type V612 Double Disc Swing Check Valve 2 Inches to 48 Inches:
  - a. Wafer style, spring loaded, cast-iron body, aluminum-bronze or ductile iron discs, EPDM resilient seats, and Type 316 stainless steel spring, hinge pin, and stop pin.
  - b. Valves 2 inches through 12 inches rated 200 psi nonshock working pressure and valves 14 inches through 48 inches rated 150 psi nonshock working pressure.
  - c. Manufacturers and Products:
    - 1) APCO; Series 9000.
    - 2) Val-Matic; Dual Disc.
    - 3) Crane/Stockham; WG-970.
    - 4) Tyco; Gulf MB Series.
- 3. Type V630 PVC Ball Check Valve 4 Inches and Smaller:
  - a. ASTM D1784, Type I, Grade 1 polyvinyl chloride body, dual union socket weld ends, rated 150 psi at 73 degrees F, and Viton seat and seal.
  - b. Manufacturers and Products:
    - 1) Nibco; Chemtrol Tru Union.
    - 2) ASAHI/America.
    - 3) Spears; True Union.
- 4. Type V631 CPVC Ball Check Valve 4 Inches and Smaller:
  - a. ASTM D1784 Cell Class 23477B CPVC body, single or dual union socket weld ends, rated 150 psi at 73 degrees F, 110 psi at 140 degrees F, Viton seat and seal.
  - b. Manufacturers and Products:
    - 1) Nibco; Chemtrol Tru Union.
    - 2) ASAHI/America.
    - 3) Spears; True Union.
- 5. Type V632 Ball Check Valve 3 Inches and Larger:
  - a. Flanged end, iron body valve with cleanout and floating type hollow steel ball, vulcanized nitrile rubber exterior, flanges ASME B16.1, Class 125, rated 150-pound working pressure, suitable for vertical up or horizontal flow.

- b. Manufacturers and Products:
  - 1) FLYGT Corp; Type 5087.
  - 2) Flomatic Corp.; Model PRX.
  - 3) “Or-equal.”
- 6. Type V638 Foot Valve 3 Inches and Larger:
  - a. Cast iron body, flanged ends in accordance with ASME B16.1 Class 125, full-port design, bronze seat, stainless steel trim, Buna-N seal, and stainless steel heavy-duty basket screen bolted to the inlet flange. Headloss across valve at shall be less than 18 inches when passing 210 gpm.
  - b. Manufacturers and Products:
    - 1) Val-Matic; Series 1900.
    - 2) APCO; Series 1400.
    - 3) “Or-equal.”
- 7. Type V642 Reduced-Pressure Principle Backflow Prevention Assembly 3/4 Inch to 10 Inches:
  - a. Two resilient seated check valves with an independent relief valve between the valves, two outside screw and yoke resilient-seated isolation valves, test cocks, in accordance with AWWA C511, rated 175 psi maximum working pressure, meets requirements of USC Foundation For Cross-Connection Control and Hydraulic Research.
  - b. Manufacturers and Products:
    - 1) FEBCO; Model 860.
    - 2) Danfoss Flomatic; Model RPZE/RPZ.
    - 3) Watts; Series 009/909.
- 8. Type V694 Check Valve 1 Inch to 48 Inches:
  - a. Elastomer type flanged or slip-on as shown on Drawings, round entry area to match pipe, contoured duckbilled shaped exit, flat bottom and off-set bill design, curved bill for 18 inches and larger, valve open with approximately 2 inches of line pressure and return to CLOSED position under zero flow condition, rated for 50 psi minimum operating pressure; flanges steel backing flange type, drilled to ASME B16.1, Class 125, plain-end valve attached with two Type 316 stainless steel adjustable bands, elastomer nylon-reinforced Buna-N.
  - b. Manufacturer and Product: Red Valve Co.; Tideflex Check Valve Series TF-1 or 35-1.
- 9. Type V695 Check Valve 1 Inch to 48 Inches:
  - a. Elastomer type, insert style, round entry area to match pipe, contoured duckbilled shaped exit, flat bottom and off-set bill design, valve open with approximately 2 inches of line pressure and return to CLOSED position under zero flow condition, rated for 50 psi minimum operating pressure; flanges integral, metal



backed, rubber flange to attach directly to flanged-end pipe connections; Viton or Hypalon materials.

- b. Manufacturer and Product: Cla-Val; Series RF-DBI.

G. Self-Regulated Automatic Valves:

1. Type V710 Pressure-Reducing Valve 2-1/2 Inches and Smaller:
  - a. Direct diaphragm operated, spring controlled, bronze body, NPT threaded ends, 200-psig rated minimum.
  - b. Size/Rating: As shown in Self-Regulating Valve Schedule.
  - c. Manufacturers and Products:
    - 1) Fisher; Type 75A.
    - 2) Watts; Series 223.
    - 3) "Or-equal."
2. Type V712 Pressure-Reducing Valve 1 Inches to 2 Inches:
  - a. Direct diaphragm, spring controlled, cast-iron body, aluminum diaphragm and spring case, nitrile disc/diaphragm/O-rings, internal relief, NPT threaded ends, 125-psig rated.
  - b. Size/Rating: As shown in Self-Regulating Valve Schedule.
  - c. Manufacturer and Product: Fisher; S200 Series.
3. Type V714 Pressure-Reducing Valve 3 Inches and Larger:
 

- a. Hydraulically operated, diaphragm actuated, pilot controlled globe valve, ductile iron body, ASME B16.42+ Class 150 flanged ends, rated ~~250 psi~~ for working pressure as shown in the Self-Regulated Valve Schedule, bronze or stainless steel trim, stainless steel stem, externally mounted strainers with cocks, maintains a constant downstream pressure regardless of fluctuations in flow or upstream pressure.

  - b. FDA approved fusion bonded epoxy lining and coating installed in accordance with AWWA C550.
  - c. Size/Rating: As shown in Self-Regulated Valve Schedule.
  - d. Manufacturers and Products:
    - 1) Cla-Val; 90-01 Series.
    - 2) Singer; Model 106PR.
    - 3) "Or-equal."
4. Type V715 Pressure-Reducing Valve 3 Inches and Larger:
  - a. Hydraulically operated, diaphragm actuated, pilot controlled globe valve with externally mounted strainers with cocks. Maintains a constant downstream pressure regardless of fluctuations in flow or upstream pressure.
  - b. Cavitation control trim assembly engineered and warranted to prevent or minimize valve cavitation. Size, quantity, and position of orifices shall be optimized to the operating parameters shown in the Self-Regulated Valve Schedule. Orifice plates or other non-

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- engineered cavitation control devices shall not be required or used to prevent or minimize valve cavitation.  
Orifice plates or other non-engineered cavitation control devices shall not be required or used to prevent or minimize valve cavitation.
- c. Ductile iron body, ASME B16.42 Class 300 flanged ends, rated for at least 350 psi working pressure, bronze or stainless steel trim, stainless steel stem,
  - d. FDA approved fusion bonded epoxy lining and coating installed in accordance with AWWA C550.
  - e. Size/Rating: As shown in the Self-Regulated Valve Schedule.
  - f. Manufacturers and Products:
    - 1) Cla-Val; 90 01KO Series.
    - 2) Singer; Model 106-AC.
    - 3) "Or-equal."
5. Type V716 Pressure-Reducing/Back-Pressure Sustaining Valve 3 Inches and Larger:
- a. Hydraulically operated, diaphragm actuated, pilot controlled globe valve, ductile iron body, ASME B16.1 Class 150 flanged ends, rated 250 psi, bronze or stainless steel trim, stainless steel stem, externally mounted strainers with cocks, maintains a constant downstream pressure while maintaining a minimum upstream pressure.
  - b. FDA approved fusion bonded epoxy lining and coating installed in accordance with AWWA C550.
  - c. Size/Rating: As shown in the Self-Regulating Valve Schedule.
  - d. Manufacturers and Products:
    - 1) Cla-Val; 92-01 Series.
    - 2) Singer; Model 106PR-R.
    - 3) "Or-equal."
6. Type V720 PVC Pressure Relief, By-Pass Relief, Back-Pressure Regulator, Back-Pressure, Anti-Siphon Valve 1/2 Inch to 2 Inches:
- a. Direct acting diaphragm, spring controlled, in-line pattern, NPT threaded inlet and outlet, 150 psi design pressure.
  - b. PVC, CPVC, or PVDF body, Teflon or Viton diaphragm, PVC or Teflon piston, high-density polyethylene or stainless steel adjusting bolt and locknut, stainless steel or coated steel spring, stainless steel fasteners. Materials shall be coordinated for each chemical when used for chemical service.
  - c. Designed to open when upstream pressure reaches setpoint; set pressure adjustable from 10 psi to 100 psi, minimum. Factory set pressure setting as shown in the Self-Regulating Valve Schedule.

- d. Manufacturers and Products:
  - 1) Plast-O-Matic; Series RVDT.
  - 2) Griffco; Series BPV.
  - 3) Primary Fluid Systems; TOP Valve.
- 7. Type V722 PVC Pressure Regulating Valve, 1/2 Inch to 1-1/2 Inches:
  - a. Diaphragm operated assembly, spring controlled, in-line pattern, NPT threaded inlet and outlet, 150 psi design pressure.
  - b. PVC body, Viton seals and diaphragm, coated stainless steel spring, stainless steel adjusting bolt, locknut, and fasteners.
  - c. Designed to regulate downstream pressure closing when pressure reaches setpoint; set pressure adjustable from 5 psi to 50 psi. Factory set pressure setting at pressure as shown in the Self-Regulating Valve Schedule.
  - d. Manufacturers and Products:
    - 1) Plast-O-Matic, Series PR.
    - 2) Hayward; Pressure Regulator.
    - 3) "Or-equal."
- 8. Type V740 Air and Vacuum Valve 1/2 Inch to 16 Inches:
  - a. 1/2-inch through 3-inch NPT inlets and outlets, 4-inch and larger ASME B16.1 Class 125 flanged inlet with plain outlet and protective hood.
  - b. Rated 150 psi working pressure, cast-iron or ductile iron body and cover, stainless steel float and trim, built and tested to AWWA C512. Operating pressure as shown in the Self-Regulating Valve Schedule.
  - c. Manufacturers and Products:
    - 1) APCO Valve and Primer Corp.; Series 140 or 150.
    - 2) Val-Matic Valve; Series 100.
    - 3) "Or-equal."
- 9. Type V742 Air and Vacuum Valve 1/2 Inch to 16 Inches for Vertical Turbine Service:
  - a. Equip 1/2 inch through 3 inches with stainless steel diffuser screen to break up solid water column before coming in contact with float, manufacturer's standard double acting throttling device in outlet for throttling, NPT threaded inlet and outlet.
  - b. Equip 4 inches and larger with anti-slam device to throttle flow of water into air valve. Design anti-slam device to permit full, unrestricted flow of air into and out of air valve, but reduce flow area for water to approximately 10 percent. ASME B16.1 Class 125 flanged inlet and NPT threaded outlet.
  - c. Rated 150 psi working pressure, cast-iron or ductile iron body and cover, stainless steel float and trim, built and tested to AWWA C512.

- d. Manufacturers and Products:
  - 1) APCO Valve and Primer Corp.; Series 141DAT to 146DAT or Series 1904 to 1916.
  - 2) Val-Matic Valve; Series 100WS to 116WS.
  - 3) “Or-equal.”
- 10. Type V744 Air Release Valve 1/2 Inch to 2 Inches:
  - a. Suitable for water service, automatically exhaust small amounts of entrained air that accumulates in a system. In CLOSED position, seat against resilient seat to prevent water leakage.
  - b. Rated 150 psi working pressure, cast-iron or ductile iron body and cover, stainless steel float and trim, NPT threaded inlet and outlet, built and tested to AWWA C512. Operating pressure as shown in the Self-Regulated Valve Schedule.
  - c. Manufacturers and Products:
    - 1) APCO Valve and Primer Corp.; Series 50, 200, and 200A.
    - 2) Val-Matic Valve; Series 15A to 45.6.
    - 3) “Or-equal.”
- 11. Type V746 Combination Air Release Valve 1 Inch to 16 Inches:
  - a. Suitable for water service, combines operating features of air and vacuum valve and air release valve. Air and vacuum portion to automatically exhaust air during filling of system and allow air to re-enter during draining or when vacuum occurs. Air release portion to automatically exhaust entrained air that accumulates in system.
  - b. Valve single body or dual body, air release valve mounted on air and vacuum valve, isolation valve mounted between the dual valves. 1-inch through 3-inch valves with NPT threaded inlet and outlet, 4-inch and larger valves with ASME B16.1 Class 125 flanged inlet and cover outlet.
  - c. Rated 150 psi working pressure, cast-iron or ductile iron body and cover, stainless steel float and trim, built and tested to AWWA C512.
  - d. Manufacturers and Products:
    - 1) APCO Valve and Primer Corp.; Series 143C to 147C or 1804 to 1816.
    - 2) Val-Matic Valve; Series 201C to 203C or 104/22 to 116/38.
    - 3) “Or-equal.”
- 12. Type V750 Sewage Air and Vacuum Valve 2 Inches to 14 Inches:
  - a. Suitable for sewage service; automatically exhausts air during system filling and allows air to re-enter during draining or when vacuum occurs.
  - b. Rated working pressure of 150 psi, 1-inch through 3-inch valves with NPT threaded inlet and outlet, 4-inch and larger valves with ASME B16.1 Class 125 flanged inlet and threaded cover outlet, built and tested to AWWA C512.

- c. Materials: Cast-iron or ductile iron body and cover, concave or skirted stainless steel float and trim, Buna-N seat.
  - d. Sewage air and vacuum valve fitted with blowoff valve, flushing valve with quick disconnect couplings, and a minimum 5 feet of hose with quick disconnect couplings to permit backflushing after installation without dismantling valve.
  - e. Manufacturers and Products:
    - 1) APCO Valve and Primer Corp.; Series 401 SAVV to 414 SAVV.
    - 2) Val-Matic Valve; Series 301 to 306.
    - 3) "Or-equal."
13. Type V780 PVC Conservation Vent Valve, 8 Inches:
- a. PVC pipe-away pressure and vacuum breather vent, suitable for sulfuric acid service, combined pressure and vacuum release valve. Automatically exhaust air during filling of system and allow air to re-enter during draining or when vacuum occurs.
  - b. PVC body, cover, and hood; FEP diaphragms; PVC hardware; FEP coated steel weights.
  - c. Self-draining body design to keep condensate away from seating surface; ASME B16.1, Class 125 flanged inlet and cover outlet.
  - d. Manufacturers and Products:
    - 1) The Protectoseal Company; Series PVC18548.
    - 2) "Or-equal."

#### H. Miscellaneous Valves:

- 1. Type V903 Diaphragm Valve, 1/2 Inch to 4 Inches:
  - a. Weir type with CPVC Type 4, Grade 1 body, PTFE with EPDM or Viton backing and with PVDF gas barrier diaphragm, double union design, solvent weld socket ends, handwheel operator, position indicator, adjustable travel stop, clear molded acrylic stem cap.
  - b. Manufacturers and Products:
    - 1) ASAHI/AMERICA; Diaphragm Valve Type 14.
    - 2) ITT Engineered Valves; Dia-Flo.
    - 3) Saunders Valve; Diaphragm Valve.
- 2. Type V905 Pinch Valve 1 Inch to 12 Inches:
  - a. Cast-iron fully enclosed body, epoxy lined and coated, ASME B16.1 Class 125 flanged ends, one-piece molded Buna-N elastomer tube, full-port design, 90 psi minimum working pressure, double-acting upper and lower pinch bars that close on centerline, stainless steel stem, handwheel operator, position indicator, geared operator for valves 6 inches and larger.

- b. Manufacturers and Products:
  - 1) Red Valve Co.; Series 75.
  - 2) RF Technologies, Inc.; RF Valve.
  - 3) "Or-equal."
- 3. Type V916 Cast Stainless Steel Mud Valve 4 Inches to 20 Inches:
  - a. Heavy-duty CF8M stainless steel yoke, flange, guides, and gate; SBR rubber or Buna-N seat mechanically retained with Type 316 stainless steel fasteners, rising stem. Stainless steel casting to be passivated per ASTM A380. Type 316 stainless steel one-piece stem with integral thrust collar and coated with antigalling compound.
  - b. Stem extension one-piece Type 316 stainless steel, 2-inch operating nut, floor box with position indicator. Stem guides Type 316 stainless steel with bronze bushings for L/R of 200 maximum. Cast top and bottom stem couplings Type 316 stainless steel.
  - c. Manufacturers:
    - 1) Troy Valve.
    - 2) Trumbull Industries, Inc.
    - 3) "Or-equal."
- 4. Type V925 Sampling Valve:
  - a. Type 316 stainless steel wetted parts, hand operated iron crank, piston to extend to inner surface of vessel or pipe, sealed by two compressible replaceable Teflon rings, one above discharge port and other below discharge port, 3/4-inch NPT inlet and 3/4-inch NPT outlet
  - b. Manufacturers and Products:
    - 1) Strahman Valves, Inc.; Piston Type Sampling Valve.
    - 2) Fetterolf Corporation; Rod-Seal Sampling Valve.
    - 3) "Or-equal."
- 5. Type V940 Solenoid Valve 1/4 Inch to 2 Inches:
  - a. Two-way internal pilot operated diaphragm type, brass body, resilient seat suitable for air or water, solenoid coil molded epoxy, NEMA insulation Class F, 120 volts ac, 60-Hz, unless otherwise indicated. Solenoid enclosure NEMA 250, Type 4 unless otherwise indicated. Size and normal position (when de-energized) as indicated on the Electric Actuated Valve Schedule.
  - b. Minimum operating pressure differential no greater than 5 psig, maximum operating pressure differential not less than 125 psig.
  - c. Manufacturers and Products:
    - 1) ASCO.
    - 2) Skinner.
    - 3) "Or-equal."

## 2.06 OPERATORS AND ACTUATORS

## A. Manual Operators:

1. General:
  - a. For AWWA valves, operator force not to exceed requirements of applicable valve standard. Provide gear reduction operator when force exceeds requirements.
  - b. For non-AWWA valves, operator force not to exceed applicable industry standard or 80 pounds, whichever is less, under operating condition, including initial breakaway. Provide gear reduction operator when force exceeds requirements.
  - c. Operator self-locking type or equipped with self-locking device.
  - d. Position indicator on quarter-turn valves.
  - e. Worm and gear operators one-piece design, worm-gears of gear bronze material. Worm of hardened alloy steel with thread ground and polished. Traveling nut type operator's threaded steel reach rod with internally threaded bronze or ductile iron nut.
2. Exposed Operator:
  - a. Galvanized and painted handwheel.
  - b. Cranks on gear type operator.
  - c. Chain wheel operator with tieback, extension stem, floor stand, and other accessories to permit operation from normal operation level.
  - d. Valve handles to take a padlock and wheels a chain and padlock.
  - e. Remote Indication:
    - 1) Limit switch that closes when valve is fully OPENED for connection to and monitoring by plant control system. Manual valve limit switches are only applicable to specific valves as indicated on Drawings.
    - 2) Limit switch that closes when valve is fully CLOSED for connection to and monitoring by plant control system. Manual valve limit switches are only applicable to specific valves as indicated on Drawings.
3. Buried Operator:
  - a. Buried service operators on valves larger than 2-1/2 inches shall have a 2-inch AWWA operating nut. Buried operators on valves 2 inches and smaller shall have cross handle for operation by forked key. Enclose moving parts of valve and operator in housing to prevent contact with the soil.
  - b. Buried service operators to be grease packed and gasketed to withstand submersion in water to 20 feet minimum.
  - c. Buried valves shall have extension stems, bonnets, and valve boxes.

- d. Remote Indication:
  - 1) Limit switch that closes when valve is fully OPENED for connection to and monitoring by plant control system. Manual valve limit switches are only applicable to specific valves as indicated on Drawings.
  - 2) Limit switch that closes when valve is fully CLOSED for connection to and monitoring by plant control system. Manual valve limit switches are only applicable to specific valves as indicated on Drawings.

B. Electric Operators, 120 Volts:

- 1. General:
  - a. Unit shall be low profile to reduce amount of required space and weigh 15 pounds or less.
  - b. Size to 1-1/2 times required operating torque. Motor stall torque not to exceed torque capacity of the valve.
  - c. Provide operator mounting bracket to mount operator to valve providing minimal torque to piping system when operating.
  - d. Ethernet I/P connectivity.
- 2. Operator Operation, General:
  - a. Suitable for full 90-degree rotation of quarter-turn valves.
  - b. Manually override handwheel.
  - c. Mechanical valve position indication.
- 3. Electronic Control:
  - a. Torque Limiting Switches: Two single pole, double throw mechanical switches. Switches operate at any point in valve travel.
  - b. Jammed-valve detection and protection.
  - c. Motor over-temperature detection and protection.
  - d. Travel limit switches, single pole double throw.
- 4. Open-Close (O/C) Service:
  - a. Duty cycle for intermittent ON-OFF operation shall be 25 percent.
  - b. Operator shall power to OPEN and power to CLOSE.
  - c. Local Indication and Control:
    - 1) Integral mechanical valve POSITION indication, 0 percent to 100 percent OPENED.
    - 2) Integral OPENED and CLOSED indication lights.
    - 3) Integral LOCAL-OFF-REMOTE (L-O-R).
    - 4) Integral OPEN maintained switch which causes the valve to stroke full OPENED, even if OPEN switch is released, while L-O-R switch is in LOCAL.
    - 5) Integral CLOSE maintained switch which causes valve to stroke full CLOSED, even if CLOSED switch is released, while L-O-R switch is in LOCAL.



- d. Remote Indication and Control:
- 1) Relay contact that closes when valve is capable of being controlled remotely (L-O-R switch in REMOTE) for connection to and monitoring by plant control system.
  - 2) Limit switch that closes when valve is fully OPENED for connection to and monitoring by plant control system.
  - 3) Limit switch that closes when valve is fully CLOSED for connection to and monitoring by plant control system.

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e.5. Modulating (M) Service:

- 1)a. Operator rated for continuous duty with servo shall be rated for 100 percent modulating operation.
- 2)b. Operator shall modulate based on an externally applied ~~4 mA to 20 mA de~~ Ethernet I/P signal.
- 3)c. Operator shall be equipped with an electronic servo module for valve modulation.
  - a)1) Module shall provide serial communications with provided cable for setup of valve operation.

f.d. Local Indication and Control:

- 1) Integral mechanical valve POSITION indication, 0 percent to 100 percent OPENED.
- 2) Integral OPENED and CLOSED indication lights.
- 3) Integral LOCAL-OFF-REMOTE (L-O-R).
- 4) Integral OPEN momentary switch which causes valve to stroke towards OPENED, as long as OPEN switch is held, while L-O-R switch is in LOCAL.
- 5) Integral CLOSE momentary switch which causes valve to stroke towards CLOSED, as long as CLOSED switch is held, while L-O-R switch is in LOCAL.
- 6) Position valve proportionally 0 to 100 percent OPEN with external ~~4 mA to 20 mA de~~ Ethernet I/P signal while in REMOTE.

g.e. Remote Indication and Control:

- 1) Relay contact that closes when valve is capable of being controlled remotely (L-O-R switch in REMOTE) for connection to and monitoring by plant control system.
- 2) ~~Limit switch that closes when valve is fully OPENED for connection to and monitoring by plant control system.~~
- 3) ~~Limit switch that closes when valve is fully CLOSED for connection to and monitoring by plant control system.~~
- 4)2) Current Position Transmitter, Ethernet I/P ~~4 mA to 20 mA de~~ signal in proportion to 0 percent to 100 percent OPENED, with 0.5 percent accuracy and 0.5 percent repeatability, ~~capable of driving a 750 ohm load, for connection to and monitoring by Plant Control System.~~

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~~5.6.~~ Control Features: Electric motor actuators with features as noted above, and as modified/supplemented in Electric Actuated Valve Schedule.

~~6.7.~~ Manufacturer and Product:

- a. Auma.
- b. Rompack.
- c. "Or-equal."

C. Electric Motor Actuators, 480 Volts:

1. General:
  - a. Comply with latest version of AWWA C542.
  - b. Size to 1-1/2 times required operating torque. Motor stall torque not to exceed torque capacity of valve.
  - c. Controls integral with actuator and fully equipped as specified in AWWA C542.
  - d. Stem protection for rising stem valves.
  - e. Ethernet I/P connectivity.
2. Actuator Operation—General:
  - a. Suitable for full 90-degree rotation of quarter-turn valves or for use on multiturn valves, as applicable.
  - b. Manual override handwheel.
  - c. Valve position indication.
  - d. Operate from FULL CLOSED to FULL OPEN positions or the reverse in the number of seconds given in Electric Actuated Valve Schedule.
  - e. Nonintrusive Electronic Control: Local controls, diagnostics, and calibration, including limit and torque settings, shall be accomplished nonintrusively. Electronic valve position display with capability to show continuous torque output. If applicable, provide two hand-held configuration units for every 10 actuators provided, two minimum.
3. Open-Close(O/C)/Throttling(T) Service:
  - a. Size motors for one complete OPEN-CLOSE-OPEN cycle no less than once every 10 minutes.
  - b. Actuator suitable for throttling operation of valve at intermediate positions.
  - c. LOCAL-OFF-REMOTE Selector Switch, padlockable in each position:
    - 1) Integral OPEN-STOP-CLOSE momentary pushbuttons with seal-in circuits to control valve in LOCAL position.
    - 2) Remote OPEN-STOP-CLOSE momentary control dry contact inputs in REMOTE position. Integral seal-in circuits for remote OPEN and CLOSE commands; valve travel stops when remote STOP contact opens.
    - 3) Auxiliary contact that closes in REMOTE position.

- d. OPEN and CLOSED indicating lights.
- e. Integral reversing motor starter with built-in overload protection.
- 4. Modulating (M) Service:
  - a. Size actuators for continuous modulating duty.
  - b. Feedback potentiometer, or equivalent, and integral electronic positioner/comparator circuit to maintain valve position.
  - c. HAND-OFF-AUTO (Local-Off-Remote) Selector Switch, padlockable in each position:
    - 1) Integral OPEN-STOP-CLOSE momentary pushbuttons with seal-in circuits to control valve in HAND (Local) position.
    - 2) Ethernet I/P 4 mA to 20 mA dc input signal to control valve in AUTO (Remote) position.
    - 3) Auxiliary contact that closes in AUTO (Remote) position.
  - d. OPEN and CLOSED indicating lights.
  - e. Ac motor with solid state reversing starter or dc motor with solid state reversing controller, and built-in overload protection. Controller capable of 1,200 starts per hour.
  - f. Duty cycle limit timer and adjustable band width, or equivalent, to prevent actuator hunting.
  - g. Valve position output converter that generates ~~isolated Ethernet I/P 4 mA to 20 mA dc~~ signal in proportion to valve position, ~~and is capable of driving into loads of up to 500 ohms at 24 volts dc.~~
- 5. Limit Switch:
  - a. Single-pole, double-throw (SPDT) type, field adjustable, with contacts rated for 5 amps at 120 volts ac.
  - b. Each valve actuator to have a minimum of two auxiliary transfer contacts at end position, one for valve FULL OPEN and one for valve FULL CLOSED.
  - c. Housed in actuator control enclosure.
- 6. Control Features: Electric motor actuators with features as noted above, and as modified/supplemented in Electric Actuated Valve Schedule.
- 7. Manufacturers and Products:
  - a. AUMA.
  - b. "Or-equal."

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2.07 ACCESSORIES

- A. Tagging: 1-1/2-inch diameter heavy brass or stainless steel tag attached with No. 16 solid brass or stainless steel jack chain for each valve bearing valve tag number shown on the Valve Schedules.
- B. Limit Switch:
  - 1. Factory installed NEMA 4X limit switch by actuator manufacturer.
  - 2. SPST, rated at 5 amps, 120 volts ac.

C. T-Handled Operating Wrench:

1. One each galvanized operating wrenches, 4 feet long.
2. Manufacturers and Products:
  - a. Mueller; No. A-24610.
  - b. Clow No.; F-2520.
  - c. "Or-equal."
3. One each galvanized operating keys for cross handled valves.

D. Extension Bonnet for Valve Operator: Complete with enclosed stem, extension, support brackets, and accessories for valve and operator.

1. Manufacturers and Products:
  - a. Pratt.
  - b. DeZurik.
  - c. "Or-equal."

E. Floor Stand:

1. Nonrising, heavy pattern, indicating type.
2. Complete with solid extension stem, coupling, handwheel, stem guide brackets, and yoke attachment. Stem length as required to connect valve operating nut and floor stand.
3. Stem Guide: Space such that stem L/R ratio does not exceed 200.
4. Anchor Bolts: Type 304 stainless steel.
5. Manufacturers and Products:
  - a. Clow; Figure F-5515.
  - b. Mueller, Figure A-26426.
  - c. "Or-equal."

F. Floor Box:

1. Plain type, for support of nonrising type stem.
2. Complete with solid extension stem, operating nut, and stem guide brackets. Stem length as required to extend valve operating nut to within 3 inches of finish floor.
3. Stem Guide: Space such that stem L/R ratio does not exceed 200.
4. Anchor Bolts: Type 304 stainless steel.
5. Manufacturers and Products:
  - a. Neenah Foundry; R 7506.
  - b. Clow; No. F5690.
  - c. "Or-equal."

## G. Chain Wheel and Guide:

1. Handwheel direct-mount type.
2. Complete with chain.
3. Galvanized or cadmium-plated.
4. Manufacturers and Products:
  - a. Clow Corp.; Figure F-5680.
  - b. Walworth Co.; Figure 804.
  - c. DeZurik Corp.; Series W or LWG.

**PART 3 EXECUTION**

## 3.01 INSTALLATION

## A. Flange Ends:

1. Flanged valve bolt holes shall straddle vertical centerline of pipe.
2. Clean flanged faces, insert gasket and bolts, and tighten nuts progressively and uniformly.

## B. Screwed Ends:

1. Clean threads by wire brushing or swabbing.
2. Apply joint compound.

## C. PVC and CPVC Valves: Install using solvents approved for valve service conditions.

## D. Valve Installation and Orientation:

1. General:
  - a. Install valves so handles operate from fully open to fully closed without encountering obstructions.
  - b. Install valves in location for easy access for routine operation and maintenance.
  - c. Install valves per manufacturer's recommendations.
2. Gate, Globe, and Ball Valves:
  - a. Install operating stem vertical when valve is installed in horizontal runs of pipe having centerline elevations 4 feet 6 inches or less above finished floor, unless otherwise shown.
  - b. Install operating stem horizontal in horizontal runs of pipe having centerline elevations greater than 4 feet 6 inches above finish floor, unless otherwise shown.

3. Eccentric Plug Valves:
    - a. Unless otherwise restricted or shown on Drawings, install valve as follows:
      - 1) Liquids with suspended solids service with horizontal flow: Install valve with stem in horizontal position with plug up when valve is open. Install valve with seat end upstream (flow to produce unseating pressure).
      - 2) Liquids with suspended solids service with vertical flow: Install valve with seat in highest portion of valve (seat up).
      - 3) Clean Liquids and Gas Service: Install valve with seat end downstream of higher pressure when valve is closed (higher pressure forces plug into seat).
  4. Butterfly Valves:
    - a. Unless otherwise restricted or shown on Drawings, install valve a minimum of 8 diameters downstream of a horizontal elbow or branch tee with shaft in horizontal position.
    - b. For vertical elbow or branch tee immediately upstream of valve, install valve with shaft in vertical position.
    - c. For horizontal elbow or branch tee immediately upstream of valve, install valve with shaft in horizontal position.
    - d. When installed immediately downstream of swing check, install valve with shaft perpendicular to swing check shaft.
    - e. For free inlet or discharge into basins and tanks, install valve with shaft in vertical position.
  5. Check Valves:
    - a. Install valve in accordance with manufacturer's instructions and provide required distance from immediate upstream fitting.
    - b. Install valve in vertical flow (up) piping only for gas services.
    - c. Install swing check valve with shaft in horizontal position.
    - d. Install double disc swing check valve to be perpendicular to flow pattern when discs are open.
  6. Solenoid Valves: Install in accordance with manufacturer's instructions.
- E. Install line size ball valve and union upstream of each solenoid valve, in-line flow switch, or other in-line electrical device, excluding magnetic flowmeters, for isolation during maintenance.
- F. Install safety isolation valves on compressed air lines.
- G. Locate valve to provide accessibility for control and maintenance. Install access doors in finished walls and plaster ceilings for valve access.
- H. Extension Stem for Operator: Where depth of valve operating nut is 3 feet or greater below finish grade, furnish operating extension stem with 2-inch operating nut to bring operating nut to a point within 6 inches of finish grade.

- I. Torque Tube: Where operator for quarter-turn valve is located on floor stand, furnish extension stem torque tube of a type properly sized for maximum torque capacity of valve.
- J. Floor Box and Stem: Steel extension stem length shall locate operating nut in floor box.
- K. Chain Wheel and Guide: Install chain wheel and guide assemblies or chain lever assemblies on manually operated valves over 6 feet 9 inches above finish floor. Install chain to within 3 feet of finish floor. Where chains hang in normally traveled areas, use appropriate "L" type tie-back anchors. Install chains to within operator horizontal reach of 2 feet 6 inches maximum, measured from normal operator standing location or station.

### 3.02 TESTS AND INSPECTION

- A. Valve may be either tested while testing pipelines, or as a separate step.
- B. Test that valves open and close smoothly under operating pressure conditions. Test that two-way valves open and close smoothly under operating pressure conditions from both directions.
- C. Inspect air and vacuum valves as pipe is being filled to verify venting and seating is fully functional.
- D. Count and record number of turns to open and close valve; account for discrepancies with manufacturer's data.
- E. Set, verify, and record set pressures for relief and regulating valves.
- F. Automatic valves to be tested in conjunction with control system testing. Set opening and closing speeds, limit switches, as required or recommended by Engineer.
- G. Test hydrostatic relief valve seating; record leakage. Adjust and retest to maximum leakage of 0.1 gpm per foot of seat periphery.

### 3.03 MANUFACTURER'S SERVICES

- A. See Section 01 43 33, Manufacturers' Field Services, and Section 01 91 14, Equipment Testing and Facility Startup.

## 3KINGS WTP PHASE III DESIGN

### 3.04 SUPPLEMENTS

- A. The supplements listed below, following “End of Section,” are part of this Specification.
1. Electric Actuated Valve Schedule.
  2. Self-Regulated Valve Schedule.
  3. Check Valve Schedule
  4. Manual Valve Schedule

**END OF SECTION**



