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PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American Society of Mechanical Engineers (ASME):
2. American Society of Sanitary Engineers (ASSE): 1011, Performance Requirements for Hose Connection Vacuum Breakers.
3. American Water Works Association (AWWA):
   b. C500, Metal-Seated Gate Valves for Water Supply Service.
   c. C504, Rubber-Seated Butterfly Valves.
   d. C507, Ball Valves, 6 in. Through 48 in. (150 mm Through 1200 mm).
   e. C508, Swing-Check Valves for Waterworks Service, 2-in. through 24-in. (50 mm Through 600 mm) NPS.
   g. C510, Double Check Valve, Backflow Prevention Assembly.
   h. C511, Reduced-Pressure Principle Backflow Prevention Assembly.
   k. C606, Grooved and Shouldered Joints.
   l. C800, Underground Service Line Valves and Fittings.
4. ASTM International (ASTM):
   e. B62, Standard Specification for Composition Bronze or Ounce Metal Castings.
   h. B139, Standard Specification for Phosphor Bronze Rod, Bar and Shapes.


6. FM Global (FM).

7. Food and Drug Administration (FDA).

8. International Association of Plumbing and Mechanical Officials (IAPMO).

9. 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 & 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


11. Underwriters Laboratories (UL).

12. USC Foundation for Cross-Connection Control and Hydraulic Research.

1.02 SUBMITTALS

A. All submittal information shall be provided in English.

B. Approval Required Prior to Work 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. Power and control wiring diagrams, including terminals and numbers.
   d. For each power actuator provided, Manufacturer’s standard data sheet, with application specific features and options clearly identified.
   e. Sizing calculations for open-close/throttle and modulating valves.

C. Approval Required Submittals:

1. Manufacturer’s Certificate of Compliance, in accordance with Section 01 43 33, Manufacturers’ Field Services, for:
a. Electric actuators; full compliance with AWWA C540.
b. Butterfly valves; full compliance with AWWA C504.

2. Certification for compliance to NSF 61 for valves used for drinking water service.
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. All manual valves shall be provided with locking handles or kit, including handwheel operators.

C. Valve to be suitable for intended service. Renewable parts not to be of a lower quality than specified.

D. Valve same size as adjoining pipe, unless otherwise called out on Drawings or in Supplements.

E. Valve ends to suit adjacent piping.

F. 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.

G. Size operators and actuators to operate valve for the full range of pressures and velocities.

H. Valve to open by turning counterclockwise, unless otherwise specified.

I. Factory mount operator, actuator, and accessories.

**2.02 SCHEDULE**

A. Additional requirements relative to this section are shown in the Power-Operated Valve Schedule, Pneumatic Actuator Schedule, and Self-Regulated Valve Schedule located on the Drawings.
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 (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. 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 NSF61.
3. Furnish certification that product is certified as suitable for contact with drinking water by an accredited certification organization in accordance with NSF 61. Provide certification for each valve type used for drinking water service.

2.04 FACTORY FINISHING

A. Epoxy Lining and Coating:

1. Use where specified for individual valves described herein.
2. In accordance with AWWA C550 unless otherwise specified.
3. Either two-part liquid material or heat-activated (fusion) material except only heat-activated material if specified as “fusion” or “fusion bonded” epoxy.
4. Minimum 7-mil dry film thickness except where limited by valve operating tolerances.

B. Exposed Valves:

1. In accordance with Section 09 90 00, Painting and Coating.
2. Safety isolation valves and lockout valves with handles, handwheels, or chain wheels “safety yellow.”

C. Buried Valves and Fire Water Systems: Refer to Section 02 66 80, Fire Water Systems.

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.
   6) Supply AWWA gate valves with stainless steel bolting.
   7) AWWA C509 and AWWA C515 valves may be substituted for each other.

2. Type V100 Gate Valve 3 Inches and Smaller:
a. All-bronze, screwed bonnet, packed gland, single solid wedge gate, nonrising stem, Class 125 rated 200 psi CWP, complies with MSS SP-80 Type 1.
   b. Manufacturers and Products:
      1) Crane; Figure 438, NPT threaded ends.
      2) Stockham; Figure B103, NPT threaded ends.
      3) Crane; Figure 1324, soldered ends.
      4) Stockham; Figure B104, soldered ends.

3. Type V120 Gate Valve 3 Inches to 48 Inches for Water Service:
a. AWWA C500, iron body, bronze mounted, flanged ends, double-disc gate, nonrising bronze stem, working water pressure 200 psi for 3 inches through 12 inches and 150 psi for 14 inches through 48 inches.
   b. Manufacturers and Products:
      1) M&H Valve Company; Style 67.
      2) Clow Valve Company; AWWA C500.

4. Type V122 Gate Valve 3 Inches to 48 Inches for Buried Water Service:
a. AWWA C500, iron body, bronze mounted, mechanical joint ends, double-disc gate, nonrising bronze stem, 2-inch operating nut, and O-ring sealed stuffing box, working water pressure of 200 psi for 3 inches through 12 inches and 150 psi for 14 inches through 48 inches.
   b. Manufacturers and Products:
      1) M&H Valve Company; Style 67.
      2) Clow Valve Company; AWWA C500.

5. Type V134 Resilient Seated Ductile Iron Gate Valve 3 Inches to 36 Inches:
a. UL Listed and FM Approved for fire protection, ductile iron body, resilient seat, bronze stem and stem nut, ANSI Class 125 flanged ends, nonrising stem, outside screw and yoke, in accordance with AWWA C515, minimum design working water pressure 200 psig, full
port, fusion epoxy coated inside and outside per AWWA C550, NSF 61 certified.

b. Manufacturers and Products:
   1) American Flow Control; Series 2500.
   2) M&H; Style 7000 and C515 Large RW Valves.

6. Type V135 Resilient Seated Ductile Iron Gate Valve 3 Inches to 36 Inches:
   a. UL Listed and FM Approved for fire protection, ductile iron body, resilient seat, bronze stem and stem nut, mechanical joint ends, nonrising stem, in accordance with AWWA C515, minimum design working water pressure 200 psig, full port, fusion epoxy coated inside and outside per AWWA C550, NSF 61 certified, indicator post flange and indicator post assembly with lockable handle.
   b. Manufacturers and Products:
      1) American Flow Control; Series 2500.
      2) M&H; Style 7000 and C515 Large RW Valves.

7. Type V142 Resilient Seated Gate Valve, Flanged Ends 4 Inches to 12 Inches:
   a. UL Listed and FM Approved, iron body, resilient seat, bronze mounted, ANSI Class 125 flanged ends, outside screw and yoke, handwheel operator, in accordance with AWWA C509, minimum design working water pressure 200 psig, full port, fusion-epoxy coated inside and outside per AWWA C550, NSF 61 certified, Supervisory switch, as specified in Section 21 13 13, Wet-Pipe Sprinkler Systems. Valve supervised in OPEN position so closing results in actuation of alarm.
   b. Manufacturers and Products:
      1) Kennedy Valve; Ken-Seal II.
      2) M&H Valve; Style 4068.
      3) Mueller; R-2360.

8. Type V144 Resilient Seated Gate Valve 4 Inches to 12 Inches:
   a. UL Listed and FM Approved for fire protection, iron body, resilient seat, bronze mounted, mechanical joint ends, nonrising stem, 2-inch operating nut, in accordance with AWWA C509, design working water pressure 200 psig, full port, fusion-epoxy coated inside and outside per AWWA C550, NSF 61 certified, indicator post flange and indicator post assembly with lockable handle.
   b. Manufacturers and Products:
      1) Kennedy Valve; Ken-Seal II.
      2) M&H Valve; Style 4067.
      3) Mueller; P-2360.

9. Type V146 PVC Gate Valve 2 Inches to 16 Inches:
   a. PVC body, FKM seals, polypropylene tapered cylinder cylindrical plug.
   b. Flat-faced flanged ends with Class 150 ASME B16.5 bolt pattern, non-rising stem, visual position indicator, handwheel for operation, cleanout plug on bottom of body.
c. Pressure Rating: 150 psi for 1-1/2-inch to 8-inch, 110 psi for 10-inch, 75 psi for 12-inch to 14-inch.

d. Manufacturers and Products:
   1) Asahi/America; Type P.
   2) Or equal.

10. Type V150 Knife Gate Valve 2” and 3”
   a. Bonnetless wafer body type, outside stem and yoke, rated for 150 psi cold water, ASME B16.1 lugged wafer style, or flanged if specified, self-cleaning, nonclogging, with round port, resilient neoprene seat, drip-tight shutoff.
   b. Wetted metal parts and stem, Type 316 stainless steel, yoke sleeve bronze, gate finish ground both sides with a sharp knife edge.
   c. Packing system leak-tight seal around the gate, valve superstructure and yoke designed for full peripheral access to gland bolts when valve is equipped with manual or power actuator.
   d. In compliance with MSS-SP-81.
   e. Manufacturers and Products:
      1) DeZurik; Series L.
      2) Rovang; Model L17.
      3) Velan Type 320.
      4) Approved Equal.

B. Globe Valves:

1. Type V234 Angle Type Hose Valve 1/2 Inch to 3/4 Inch:
   a. Bronze, angle sillcock type body, threaded or solder inlet as applicable, pressure rating 125 psi cold water.
   b. Manufacturer and Product: Nibco; No. 63 or No. 763.

2. 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 Standard 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.

3. 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, 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.

4. Type V240 PVC Globe Valve 2 Inches and Smaller:
   a. Pressure rating of 150 psi at 70 degrees F, with ASTM D1784, Type 1, Grade 1 PVC body, bonnet, stem, and gland. Union bonnet and flanged ends. EPDM or FKM gasket and gland packing.
   b. Manufacturers and Products:
      1) ASAHI/AMERICA; Manual Globe Control.
      2) Or approved equal.

C. Ball Valves:

1. Type V300 Ball Valve 3 Inches and Smaller for General Water and Air Service:
   a. Two-piece, standard port, 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, zinc-coated steel hand lever operator with vinyl grip, rated 600-pound WOG, 150-pound SWP, complies with MSS SP-110.
   b. Manufacturers and Products:
      1) Threaded:
         a) Conbraco Apollo; 70-100.
         b) Nibco; T-580-70.
      2) Soldered:
         a) Conbraco Apollo; 70-200.
         b) Nibco; S-580-70.

2. Type V304 Ball Valve 2 Inches and Smaller for General Water and Air Service:
   a. Three-piece, full port, NPT threaded ends, bronze body and end pieces, hard-chrome plated solid bronze or brass ball, RTFE seats and packing, blowout-proof stem, zinc-plated steel hand lever operator with vinyl grip, rated 600-pound WOG, 150 psi SWP, complies with MSS SP-110.
   b. Manufacturers and Products:
      1) Threaded Ends:
         a) Conbraco Apollo; 82-100.
         b) Stockham; T-395 Series.
      2) Solder Ends:
         a) Conbraco Apollo; 82-200.
         b) Stockham; S-395 Series.

3. Type V307 Stainless Steel Ball Valve 3 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.
   2) Or equal.

4. Type V308 Stainless Steel Ball Valve 3 Inches and Smaller:
   a. Full port, two-piece, threaded male x female, full port, ASTM A276 GR 316 or ASTM A351/A351M GR CF8M stainless steel body and end piece, 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 at 600 psig to CWP, complies with MSS SP-110.

   b. Manufacturers and Products:
      1) Conbraco Apollo; 7H-800 Series, Option 31.
      2) Apollo 76-100
      3) Or equal

5. 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.

6. Type V320 Vee-Ball Valve 1 Inch to 16 Inches:
   a. ANSI Class 150- pound flanged ends, Type 317 stainless steel body, heat treated nickel or hard chromium-plated type 317 stainless steel ball, splined-type 17-4 PH stainless steel shafts, reinforced PTFE flow-ring seal, reinforced PTFE V-ring packing. Valve to have 550:1 rangeability and equal percentage characteristics.

   b. Manufacturers and Products:
      1) Fisher Controls: Design V150.
      2) Dezurik: VPB V-Port ball Valve.

7. Type V330 PVC Ball Valve 1/2 Inch to 6 Inches:
   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, replaceable PTFE seats, Viton or Teflon O-ring stem seals, valve designed to block flow in both directions. Provide pressure relief hole drilled on low pressure side of ball for sodium hypochlorite service. Provide locking T-handle.

   b. Manufacturers and Products:
      1) Hayward.
      2) ASAHI/America; Type 21.
      3) Spears; True Union.

8. Type V332 PVC Ball Valve 1/2 Inch to 6 Inches:
   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, threaded ends, replaceable PTFE seats, Viton or Teflon O-ring stem seals, valve designed to block flow in both directions. Provide
pressure relief hole drilled on low pressure side of ball for sodium hypochlorite service. Provide locking T-handle.

b. Manufacturers and Products:
   1) Hayward.
   2) ASAHI/America; Type 21.
   3) Spears; True Union.

9. Type V335 CPVC Ball Valve 1/2 Inch to 2 Inches:
   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 PTFE seats, Viton or Teflon O-ring stem seals, valve designed to block flow in both directions. Provide locking T-handle.
   b. Manufacturers and Products:
      1) Hayward; TB Series.
      2) ASAHI/America; Type 21.
      3) Spears; True Union.

10. Type V340 Stainless Steel Ball Valve 3 Inches to 4 Inches:
    a. Two-piece, full port, ASTM A276 GR 316 or ASTM A351/A351M GR CF8M stainless steel body and end piece, flanged ends per ASME/ANSI B16.5 and B16.34, ASTM A276 Type 316 or ASTM A351/A351M GR CF8M stainless steel ball, reinforced PTFE seats, seals, and packing, adjustable packing gland, blowout proof stainless steel stem, stainless steel lever operator with vinyl grip, rated minimum 150 psig CWP.
    b. Manufacturers and Products:
       1) Conbraco Apollo; Series 87A-200.
       2) Nibco; Model F-515-S6-F-66-FS.

11. Type V342 Stainless Steel Ball Valve 3 Inches and Smaller:
    a. Two-piece, flanged, full port ball valve, ASTM A276 GR 316 or ASTM A351/A351M GR CF8M stainless steel body and end pieces. Type 316 stainless steel vented ball, blow-out proof stem, and packing gland. TFM or reinforced PTFE seats and seals. Pressure rating of 150 psi. Stainless steel handle with vinyl sleeve.
    b. Manufacturers and Products:
       1) Flow-Tek/Bray; Model F15.
       2) Apollo; 87A-200 Series.
       3) Or approved equal.

12. Type V345 Stainless Steel Ball Valve 3 Inches and Smaller:
    a. Two-piece, flanged, full port ball valve, ASTM A276 GR 316 or ASTM A351/A351M GR CF8M stainless steel body and end pieces with actuator mounting pad. Type 316 stainless steel vented ball, blow-out proof stem, and packing gland. TFM or reinforced PTFE seats and seals. Pressure rating of 150 psi.
b. Manufacturers and Products:
   1) Flow-Tek/Bray; Model F15.
   2) Or approved equal.

13. Type V346 Stainless Steel Ball Valve 4-Inch and Smaller:
   a. Ball valve shall be full port and of floating ball design, capable of
      providing bi-directional tight shutoff in accordance with MSS SP-72.
      Valve shall be rated for 150 psi WSP. Bodies shall be stainless steel
      in accordance with ASTM A351-CF8M, with ANSI class 150 raised
      face flanges. The ball shall be PTFE infused stainless steel with a 316
      stainless steel blowout proof stem. The seats and body seals shall be
      PTFE. The stem shall be PTFE externally adjustable chevron type.
      Valve shall be equipped with 2-Inch square operating nut.

b. Manufacturer: American Valve, Model 4001 or Equal.

14. Type V350 PVC Labcock Ball Valve 1/4 Inch:
   a. PVC body, ball, stem, connectors, FKM seats and seals, ABS lever
      handle. PVC conforming to ASTM D1784, Cell
      Classification 12454-A.
   b. End Connections: Female thread by hose.
   c. Pressure Rating: 150 psi.
   d. Manufacturers and Products:
      1) Asahi/America; Type PVC Labcock.
      2) Or equal.

15. Type V351 PVC Unibody Ball Valve 3/8 Inch to 3 Inches:
   a. PVC unibody, one-piece compact design non-union type, FKM
      backing cushions and O-rings with PTFE seats, lever handle.
   b. End Connections: Threaded.
   c. Pressure Rating: Rated 150 psi and full vacuum, blocks flow in both
      directions.
   d. Provide PVC tube adaptors for connections to tubing.
   e. Manufacturers and Products:
      1) Asahi/America; Omni Ball.
      2) Or equal.

D. Plug Valves:

1. Type V402 Stainless Steel Eccentric Plug Valve 1/2 Inch to 12 Inches:
   a. Stainless steel eccentric plug valve with 2-inch nut actuator,
      nonlubricated type rated at 150 psi working pressure, Type 316
      stainless steel body with flanged ends, plug stainless steel with FKM
      rubber facing, plug port round or rectangular of no less than
      80 percent connecting pipe area, stem bearings lubricated stainless
      steel, stem seal of FKM and TFE, PTFE grit seals.
   b. Lever operator 2 inches and smaller, totally enclosed and sealed gear
      operator 3 inches and larger.
   c. Manufacturers and Products:
1) DeZurik; PEC.
2) Or equal.

2. Type V462 Gauge Cock 1/8 Inch to 1/4 Inch:
   a. 1/4-inch bronze body, hexagon end pattern, tee head, male ends, rated 125-pound SWP.
   b. Manufacturer and Product: United Brass Works; Figure 973.

3. Type V464 Corporation Stop 1/2 Inch to 2 Inches:
   a. AWWA C800 type, tapered threaded inlet, except when connecting to tapped fittings which require IPS tapered threads, outlet compression connection or IPS threads to suit connecting pipe, stops 1 inch and smaller rated 100 psi, larger stops rated 80 psi.
   b. Manufacturers and Products:
      1) Ford Meter Box Co.
      2) Mueller Co.

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) Provide linings and coatings per AWWA, unless otherwise indicated on the Drawings or specified herein.
         9) Valves to be in full compliance with NSF 61.
      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) Provide heavy-duty, totally enclosed gear box type operator and chain wheel and guide for all valves installed 6 feet 6 inches or higher above operating floor elevation.
2. Type V500 Wafer Style Butterfly Valve, 2 Inches to 10 Inches:
   a. Wafer style PVC body with molded body stops and seat relief area to
      prevent over-tightening, PVC spherical discs, Type 316 stainless steel
      stem, Nitrile or FKM replaceable resilient seat fully molded around
      body so that disc and seat are only wetted parts, Viton or Buna-N
      replaceable seals, 2-inch square nut on stem for direct quarter turn
      operation, 150 psi working pressure rating at 70 degrees F.
   b. Manufacturers and Products:
      1) Asahi/American; Type 57.
      2) Hayward; BY Series.
      3) Spears; PVC Series.

3. Type V501 Lug Style Butterfly Valve 2 Inches to 10 Inches:
   a. Lever operated, lug style PVC body with molded body stops and seat
      relief area to prevent over-tightening, polypropylene or PVC spherical
      discs, Type 316 stainless steel stem, Nitrile or FKM replaceable
      resilient seat fully molded around body so that disc and seat are only
      wetted parts, replaceable seals, Type 316 stainless steel lug inserts,
      150 psi working pressure rating at 70 degrees F.
   b. Manufacturers and Products:
      1) ASAHI; Type 57L.
      2) Or equal.

4. Type V502 Lug Style Butterfly Valve 2 Inches to 10 Inches:
   a. Gear operated, lug style PVC body with molded body stops and seat
      relief area to prevent over-tightening, polypropylene or PVC spherical
      discs, Type 316 stainless steel stem, Nitrile or FKM replaceable
      resilient seat fully molded around body so that disc and seat are only
      wetted parts, replaceable seals, Type 316 stainless steel lug inserts,
      2-inch square nut on gear operator with handwheel, 150 psi working
      pressure rating at 70 degrees F.
   b. Manufacturers and Products:
      1) ASAHI; Type 57L.
      2) Or equal.

5. Type V503 Lug Style Butterfly Valve, Resilient Seated, 2 Inches to
   20 Inches:
   a. Lug style, cast or ductile-iron body, Type 316 stainless steel disc,
      Type 316 stainless steel one-piece stem, self-lubricating sleeve type
      bushings, Buna N or FKM replaceable resilient seat suitable for
      operating temperatures up to 200 degrees F, 150 psi working pressure
      rating, valve body to fit between ANSI Class 125/150 flanges,
      Nylon 11 coating on body. Provide gear operator.
   b. Manufacturers and Products:
      1) Bray Controls; Series 31.
      2) Or equal.
6. Type V504 Flanged Style Butterfly Valve, Resilient Seated, 24 Inches to 36 Inches:
   a. Double flange style, cast or ductile-iron body, Type 316 stainless steel disc, Type 316 stainless steel one-piece stem, self-lubricating sleeve type bushings, Buna N or FKM replaceable resilient seat suitable for operating temperatures up to 200 degrees F, 75 psi working pressure rating, valve body to fit between ANSI Class 125/150 flanges, Nylon 11 coating on body.
   b. Manufacturers and Products:
      1) Bray Controls; Series 35.
      2) Or equal.

7. 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, valve body to fit between ANSI Class 125/150 flanges, Nylon 11 coating on body.
   b. Manufacturers and Products:
      1) Bray Controls; Series 31.
      2) Or equal.

8. Type V511 Flanged Style Butterfly Valve, Resilient Seated, 24 Inches to 48 Inches for Low Pressure Process Air Service:
   a. Flanged style cast-iron body, aluminum bronze discs, Type 304 stainless steel one-piece stem, self-lubricating bronze sleeve type bearing, EPDM replaceable resilient seat suitable for operating temperatures up to 250 degrees F, 150 psi working pressure, rating, externally adjustable bronze packing gland with Buna-N packing, valve body to fit between ANSI Class 125/150 flanges, Nylon 11 coating on body.
   b. Manufacturers and Products:
      1) Bray Controls; Series 35.
      2) Or equal.

9. Type V530 Butterfly Valve 4 Inches to 20 Inches for Fire Protection Service:
   a. UL Listed and FM Approved, flanged style, AWWA C504 Class 150B valve with cast-iron body, aluminum-bronze disc, stainless steel stem, EPDM seat, geared operator with highly visible position indicator and detachable crank handle.
   b. Manufacturers and Products:
      1) Pratt; IBV or PIVA.
      2) Or equal.
F. Check and Flap Valves:

1. Type V600 Check Valve 2 Inches and Smaller:
   a. All bronze, threaded cap, threaded or soldered ends, swing type replaceable bronze disc, rated 125-pound SWP, 200-pound WOG.
   b. Manufacturers and Products:
      1) Stockham; Figure B-319, threaded ends.
      2) Milwaukee; Figure 509, threaded ends.
      3) Stockham; Figure B-309, soldered ends.
      4) Milwaukee; Figure 1509, soldered ends.

2. Type V601 PVC Double Plate Check Valve 2 Inches to 16 Inches:
   a. PVC body and plates and internals Buna-N or Viton seal, Type 316 stainless steel hinge post bolts.
   b. Wafer style for 2-inch to 8-inch, flange style for 10-inch to 14-inch with Class 150 ASME B16.5 drilling.
   c. Manufacturers and Products:
      1) Cameron Techno; PVC Technocheck.
      2) Spears; PVC Butterfly Check Valves.

3. Type V602 Stainless Steel Swing Check Valve 1/2 Inches to 12 Inches:
   a. Stainless steel body, disc, and cover ASTM A351/A351M GR CF8M, PTFE gasket and plug seal, Type 316 stainless steel hinge pin and bolting.
   b. Class 150 ASME B16.5, flanged ends.
   c. Manufacturers and Products:
      1) Crane/Aloyco; Figure 377.
      2) SCV; stainless steel check valve (Sized 2-inches to 12-inches).
      3) WM Powell Figure sized 1/2 inches to 1 ½ inches
      4) Or approved equal.

4. Type V610 Swing Check Valve 2-1/2 Inches to 12 Inches for Fire Protection Service:
   a. UL listed, FM approved, iron body, bronze-mounted, rated 175 pounds WOG, self-adjusting bronze disc, ends ASME B16.1 flanged, with a 1-inch NPT tapped and plugged boss.
   b. Manufacturers and Products:
      1) Kennedy; Figure 126.
      2) Mueller; A-2120-6.

5. Type V611 Check Valve 2 Inch to 12 Inch:
   a. All elastomer duckbill design, in-line insert style with flanged end, valve open with approximately 1 inch WC line pressure and return to CLOSED position under zero flow condition, flange drilled to ASME B16.5, Class 150, elastomer Viton
   b. Manufacturers and Products:
      1) General Rubber; Flex-Valve In-Line Style 4300.
      2) Red Valve Co.; Tideflex Check Valve Series 37.
6. Type V612 Stainless Steel Double Plate Check Valve 2 Inches to 24 Inches:
a. Short form, wafer style, Type 316 stainless steel body and internal
   plates, pins and fasteners, Type 316 stainless steel spring, Viton
   sealing member for service to 250 degrees F.
b. Suitable for mounting between Class 150 ASME B16.5 flanges,
   275 psi rating.
c. Manufacturers and Products:
   1) Camaron/Technocheck; Style 5051-316.
   2) Or equal.

7. Type V613 PVC Butterfly Check Valve, 2 Inches to 8 Inches:
a. ANSI Class 150 flat face flanges, elastomeric hinged, ASTM D1784,
   PVC Cell Class 12454 body, Type 316 stainless steel reinforced Viton
   discs with continuous Viton resilient seats, and Type 316 stainless
   steel hinge pin, support plates, and fastener materials.
b. Valves shall be rated at 150 psi non-shock cold working pressure at
   70 degrees F.
c. Manufacturers and Products:
   1) TECHNO; Style 5001-PVC.
   2) Spears; Model 5423-xxx.

8. Type V614 CPVC Butterfly Check Valve, 2 Inches to 8 Inches:
a. ANSI Class 150 flat face flanges, elastomeric hinged, ASTM D1784
   CPVC Cell Class 23477 body, Type 316 stainless steel reinforced
   EPDM discs with continuous EPDM resilient seats, and
   Type 316 stainless steel hinge pin, support plates, and fastener
   materials.
b. Valves shall be rated at 150 psi non-shock cold working pressure at
   70 degrees F.
c. Manufacturers and Products:
   1) TECHNO; Style 5001-CPVC.
   2) Spears; Model 5423-xxxC.

9. 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) Hayward.
   2) ASAHI/America.
   3) Spears; True Union.

10. 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) Hayward.
   2) ASAHI/America.
   3) Spears; True Union.
11. Type V633 PVC Swing Check Valve 4 Inches and Smaller:
   a. ASTM D1784 Cell Class 12454 PVC body, dual union socket weld ends, rated 150 psi at 73 degrees F, stainless steel spring, EPDM seat and weighted disc.
   b. Manufacturers and Products:
      1) Spears; True Union.
      2) Or equal.

12. Type V634 Rubber Flapper Check Valve 2 Inches to 24 Inches:
   a. Top entry type, stainless steel body, ASTM A296 or A351 (Grade CF8M), ASME B16.1, Class 125 flanges, steel-reinforced Viton flapper with raised seating ring, rated 150-pound CWP.
   b. Manufacturers and Products:
      1) APCO; Series 100.
      2) Val-Matic; “Swingflex” Series 500.

13. 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 nonrising stem 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.

14. Type V644 Wet Pipe Alarm Valve:
   a. Valve and Trim:
      1) UL Listed and FM Approved as a complete unit, rated 175 psi working pressure, 125-pound ASME B16.1 flanged inlet and outlet.
      2) Supplied with full trim for position as shown on Drawings including, but not necessarily limited to, water pressure gauges (with test valves), alarm test valve, mechanical sprinkler alarm bell connection (with strainer), pressure switch for electric alarm signal, retarding chamber, alarm and retard chamber drains, and main drain.
      3) Provide with additional valves, piping, and fittings as required for a complete and fully functioning arrangement.
   b. Manufacturers and Products:
      1) Reliable Automatic Sprinkler Co., Inc.; Model E Alarm Valve.
      2) Tyco/Central.

15. Type V645 Wet Pipe Riser Check Valve:
   a. Valve and Trim:
      1) UL Listed and FM approved as a complete unit, rated 175 psi working pressure, grooved end inlet and outlet or 125-pound ASME B16.1 flanged inlet and outlet.
2) Supplied with full trim for position as shown on Drawings including, but not necessarily limited to, water pressure gauges (with valves, nipples and plugs), and main drain.

b. Manufacturers and Products:
   1) Victaulic; Series 717R.
   2) Reliable Automatic Sprinkler Co., Inc.; Model G.
   3) Tyco/Central; Model 90.

16. Type V646 Dry Pipe Valve Assembly:
   a. Assembly shall provide a complete and automatic dry pipe fire sprinkler system.
   b. Assembly shall include required trim and pressure gauges, air pressure maintenance device, anti-flood device, accelerator, if required by system size, water pressure actuated alarm switch connected to an electric alarm bell, and any other miscellaneous accessories required by the system served.
   c. Air Compressor (AC-Y00A): Capacity to restore normal air pressure in the system within a 30-minute period. Compressor power requirements shall not exceed 3/4 hp, 120V, single-phase. Provide automatic drain valve for condensate drain.
   d. Manufacturers and Products:
      1) Reliable; Model D with Model A Air Compressor.
      2) Central; Model A with Air Compressor.
      3) Gast: 5LLA-46T-M550GX
      4) Or engineer approved equal.

G. Self-Regulated Automatic Valves:

1. Type V711 Pressure-Reducing Valve 2 Inches and Smaller:
   a. Direct diaphragm, spring controlled, cast-iron body, spring case, composition seat and diaphragm, stainless steel valve stem, NPT threaded ends, 250-psig rated.
   b. Size/Rating: size as shown on Drawings, airflow, inlet pressure, and setpoint as listed in the valve schedule (Drawing H-2-833524-08).
   c. Manufacturer and Product: Fisher; 95H Series.

2. Type V715 Pressure-Reducing Valve 2-1/2 Inches and Smaller:
   a. Hydraulically operated, diaphragm actuated, pilot controlled globe valve, ductile iron body, ANSI 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 Valve Schedule.
   d. Manufacturer’s and Products:
      1) Cla-Val; 90-1 Series.
      2) Singer; Model 106.
3. Type V716 Pressure-Reducing/Back-Pressure Sustaining Valve 3 Inches and Larger:
   a. Hydraulically operated, diaphragm actuated, pilot controlled globe valve, ductile iron body, ANSI 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 Valve Schedule.
   d. Manufacturers and Products:
      1) Cla-Val; 692-01 Series.
      2) Singer; Model 206PR-R.

4. Type V717 Level Control Valve 3 Inches and Larger:
   a. Hydraulically operated, diaphragm actuated, pilot controlled globe valve, ductile iron body, ANSI Class 150 flanged ends, rated 250 psi, bronze or stainless steel trim, stainless steel stem, externally mounted strainers with cocks, with modulating float assembly, configured to fill downstream open topped tank on demand and shut off water when tank has achieved the predetermined set level. Configured to operate in series with upstream pressure control valve.
   b. FDA approved fusion bonded epoxy lining and coating installed in accordance with AWWA C550.
   c. Size/Rating: As shown in the Valve Schedule.
   d. Manufacturers and Products:
      1) Cla-Val; 428-01 Series.
      2) Approved Equal.

5. 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 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.
   c. Designed to open when upstream pressure reaches set point, set pressure adjustable from 10 psi to 100 psi, minimum.
   d. Manufacturers and Products:
      1) Plast-O-Matic; Series RVDT.
      2) Griffco; Series BPV.
      3) Primary Fluid Systems; TOP Valve.

6. Type V721 CPVC 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. CPVC body, Teflon or Viton diaphragm, CPVC or Teflon piston, high-density polyethylene or stainless steel adjusting bolt and locknut, stainless steel or coated steel spring, stainless steel fasteners.


c. Designed to open when upstream pressure reaches set point, set pressure adjustable from 10 psi to 100 psi, minimum.

d. Manufacturers and Products:
   1) Plast-O-Matic; Series RVDT.
   2) Griffco; Series BPV.
   3) Primary Fluid Systems; TOP Valve.

7. Type V723 Stainless Steel 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. Stainless steel body, Teflon or Viton diaphragm, Teflon piston, stainless steel adjusting bolt and locknut, stainless steel spring and fasteners.
   c. Designed to open when upstream pressure reaches set point, set pressure adjustable from 10 psi to 100 psi, minimum.
   d. Manufacturers:
      1) Primary Fluid Systems, Inc.
      2) Stra-Val.
      3) Or approved equal.

8. Type V740 Pressure Relief, Sustaining and Back Pressure Valve 2-Inch to 10-Inch:
   a. Body, cover, trim diaphragm assembly, flanges and fasteners shall be Type 316 series stainless steel with Viton disc and reinforced Viton diaphragm, and Type 316 stainless steel pilot system, minimum working pressure of 200 psi at 75 degrees F, ANSI B16.5 Class 150 flanges, with a spring setting as necessary to accommodate the required setpoint pressure per the Self Contained Valve Schedule. All wetted parts shall be stainless steel. Valve shall be provided as either full port or reduced port as determined by manufacturer based on the required performance requirements per the Self Contained Valve Schedule.
   b. Accessories:
      1) Stainless steel shutoff cock, Y-strainer, control piping and fittings, speed controls, and check controls.
      2) Where noted on the Self Contained Valve Schedule, a clean water source at 70 psig (maximum) will be provided to the pilot system. Valve shall be provided with an appropriately size pressure reducing valve for the pilot system.
      3) Manufacturers and Products:
         a) Cla-Val; Model 550-01 or 6550-01.
         b) Singer; Model 106-RPS or 206-RPS.

9. Type V750 Stainless Steel Air Release Valve 1 Inches to 2 Inches:
   a. Suitable for contaminated water service, automatically exhausts entrained air that accumulates in a system.
b. Type 316 stainless steel body, cover and wetted components, Buna-N needle, Lexide gasket, NPT inlet and outlet.

c. 150 psi pressure rating, soft durometer seat and needle for low 2 psi pressure sealing capability.

d. Manufacturers and Products:
   1) Apco Valves; Style 200A.
   2) Or equal.

10. Type V751 Stainless Steel Combination Air Valve 1 Inches to 4 Inches:
   a. Suitable for contaminated water service, combines the operating features of both an 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. The air release portion to automatically exhaust entrained air that accumulates in system.

   b. Valve single body type, NPT threaded inlet and outlet.

   c. Type 316 stainless steel body, cover and internal components, Buna-N needle and seat and bumper assembly.

   d. 150 pressure rating, soft durometer seat and needle for low 2 psi pressure sealing capability.

   e. Manufacturers and Products:
      1) Apco Valves; Style S143C.
      2) Or equal.

11. Type V752 Sewage Combination Air Valve 2 Inches to 6 Inches:
   a. Suitable for sewage service; combines the operating functions of both an air and vacuum valve and an air release valve. The air and vacuum portion shall automatically exhaust air during filling of a system and allow air to re-enter during draining or when a vacuum occurs. Air release portion to automatically exhaust entrained air that accumulates in system. Single body unit with air and vacuum valve and an air release valve in a single housing.

   b. Rated working pressure of 150 psi, built and tested to AWWA C512.

   c. Materials: ASTM A351 stainless steel body and covers, NTP threaded inlet and outlet, with concave or skirted stainless steel float and trim.

   d. Sewage air release 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) Val-Matic Valve; Series 800; VM-801ASBW.
      2) Apco Valve and Primer Corp; Series 440; S-440WA SS.

12. Type V754 Vacuum Breaker Valve 1/2-Inch to 3-Inch:
   a. Valve shall be constructed of PVC with Viton or FMK seals, with maximum working pressure of 100 psi at 75 degrees F, break vacuum at 2 inches mercury, PFA encapsulated spring loaded as a poppet seal, self sealing FKM or Viton diaphragm, and threaded union nut end connections.

   b. Manufacturers and Products:
1) Plast-O-Matic Vacuum Breaker; Series VBM or VBS.
2) Or equal.

13. Type V755 Stainless Steel Vacuum Relief Valve, 2 Inches to 12 Inches:
   a. Suitable for vacuum relief service using weighted pallets to vent from atmosphere.
   b. Type 316 stainless steel housing, cover, pallets, seat, hardware and weights, Viton gaskets and pallet seal.
   c. Flanged connection with ASME B16.5, Class 150, flat face flanges.
   d. Vacuum set pressure as specified in the Valve Schedule.
   e. Manufactures and Products:
      1) Enardo; Model 952.
      2) Or approved equal.

14. Type V756 Stainless Steel Pressure/Vacuum Relief Valve, Flanged Outlet, 2 Inches to 12 Inches:
   a. Suitable for pressure and vacuum relief service using weighted pallets to vent to and from atmosphere, with flanged outlet.
   b. Type 316 stainless steel housing, cover, pallets, seat, hardware and weights, Viton gaskets and pallet seal.
   c. Flanged connections with ASME B16.5, Class 150, flat face flanges.
   d. Pressure and vacuum set pressures as specified in the Valve Schedule.
   e. Manufactures and Products:
      1) Enardo; Model 850.
      2) Or approved equal.

15. Type V757 Stainless Steel Pressure / Vacuum Relief Valve, Domed Outlet, 2 Inches to 12 Inches:
   a. Suitable for pressure and vacuum relief service using weighted pallets to vent to and from atmosphere, with dome outlet.
   b. Type 316 stainless steel housing, cover, pallets, seat, hardware and weights, Viton gaskets and pallet seal.
   c. Flanged connection with ASME B16.5, Class 150, flat face flanges.
   d. Pressure and vacuum set pressures as specified in the Valve Schedule.
   e. Manufactures and Products:
      1) Enardo; Model 950.
      2) Or approved equal.

16. Type V758 Bronze Pressure 1/8 Inches to 1 ¼ Inches NPT:
   a. ASME Rated per Section VIII, Bearing “UV” and “NB” markings.
   b. Set pressure tolerance to within 3% of set pressure.
   c. Maximum temperature rating 350 degrees F up to ½”, 250 degrees F over ½”.
   d. Bronze housing, with stainless steel seat, ball, stem, and spring as appropriate.
   e. Pressure settings, and minimum flow as specified in the Valve Schedule.
   f. Manufactures and Products:
      1) CDI SA, ST, SN, SB, SW series
      2) Or approved equal.
17. Type V759 Steel bodied ASME Safety Relief Valve, ½ inch to 4 inches:
   a. For pressure relief service for pumped chemical feed, process piping, or, other pressurized piping systems, where indicated on the plans or data sheets.
   b. Submit vendor data sheet with proposal or quote for approval to demonstrate compliance with requirements with this specification, relevant plans, and purchasing documents.
   c. ASME Section VIII, Air/Gas/Steam/Liquid service UV National Board Certified.
   d. Materials of construction shall be fully compatible with the process fluid, including housing, cover, pallets, seat, stem, springs, and gaskets.
   e. Factory set and certified for pressure setting and leaking. Pressure settings to be as specified in the Valve Schedule or on purchase order.
   f. Factory labeling to show size, model number, serial number, flow, and pressure setting.
   g. Connections:
      1) Threaded connections, when specified, shall be NPT tapered thread meeting ASME B1.21.1
      2) Flanged connections, when specified, shall raised face meeting ASME B16.5, for the service pressure classification.
   h. Manufacturers and Products:
      1) Kunkle 9 series.
      2) Farris 2600 Series (Fluid)/2600 Series (Vapor/Gas).
      3) Approved Equal.

18. Type V760 Pressure-Reducing Valve 2-1/2 inches or smaller:
   a. Direct diaphragm operated, spring controlled, bronze body, NPT threaded ends, 200-psig rated minimum.
   b. Size/Rating: 1-inch, maximum of 50 gpm, with inlet pressure of 100 psig. Outlet pressure set at 60 psig (Adjustable range of 25 to 75 psig).
   c. Lead free brass.
   d. Union inlet connection.
   e. Integral stainless steel strainer.
   g. Manufacturers and Products:
      1) Watts; Series LF25AUB-Z3.
      2) Or Equal.

H. Miscellaneous Valves:

1. Type V902 PVC Diaphragm Valve Size 1/2–Inch to 10-Inch:
   a. PVC body, with stainless steel or PVC stem, ANSI Class 150 flanges and bolt pattern, position indicator with adjustable travel stop, PTFE or EPDM diaphragms, and bubble tight closure.
   b. Manufacturers and Products:
1) Asahi–America.
2) Or equal.

2. 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, 1-inch NPT inlet and 1-inch NPT outlet.
   b. Manufacturers and Products:
      1) Strahman Valves, Inc.; Piston Type Sampling Valve.
      2) Fetterolf Corporation; Rod-Seal Sampling Valve.

3. Type V930 Fire Hydrant: (Describe agency standard.)

4. Type V940 Solenoid Valve 1/4 Inch to 2 Inches:
   a. Two-way internal pilot operated diaphragm type, stainless steel body, resilient seat suitable for air or water, solenoid coil molded epoxy, NEMA insulation Class F, 24V DC, unless otherwise indicated. Solenoid enclosure NEMA 250, Type 4 unless otherwise indicated. Size and normal position (OPEN or CLOSED when de-energized) as indicated on Valve Schedule.
   b. Minimum operating pressure differential no greater than 5 psig, maximum operating pressure differential not less than 125 psig.
   c. Manufacturers:
      1) ASCO.
      2) Skinner.

5. Type V950 Manual In-Line Lockout/Tagout Valve 1/4 Inch to 1-1/4 Inches for Air Service:
   a. Manual in-line, 3-port, heavy-duty cast aluminum body, NPT threaded ports, tee-handle, aluminum spool, stainless steel spring, nitrile seals, suitable for air pressures 0 psig to 250 psig. Safety yellow body with contrasting black, red or blue handle.
   c. Complete with NPT male threaded aluminum exhaust silencer with internal mesh element, lockout hasp.
   d. Manufacturers and Products:
      1) Norgren; In-Line Lockout Valve Series C00.
      2) Parker Pneumatic; LV Series.
      3) Ross Controls; L-O-X Valve.

6. V961 Wall Hydrant—Nonfreeze:
   a. Nonfreeze exposed with chrome plated face, integral vacuum breaker, T-handle key, 3/4-inch inlet and hose connection.
   b. Manufacturers and Products:
      1) JC Smith; 5609.
      2) Josam; 71050.
7. V970 Stainless Steel Dry Disconnect Valve 2 Inches and Smaller for Sulfuric Acid Service:
   a. Type 316SS construction, double ball valve cam-lock assembly for transfer of sulfuric acid. Valves self-locking to prevent disconnect when valves are open, and to prevent valve from opening when not connected.
   b. Rated 100 psig max operating pressure, 300 °F max operating temperature.
   c. Seals and valve seats PTFE, or other material approved by manufacturer and CHPRC.
   d. Dual level handles for manual actuation.
   e. Manufacturers and Products:
      1) Banjo Dry-Mate 316SS; DM200ASS and DM200DSS.
      2) Or approved equal.

2.06 OPERATORS AND ACTUATORS

A. Manual Operators:

1. General:
   a. For AWWA valves, operator force not to exceed the requirements of the applicable valve standard. For non-AWWA valves, operator force not to exceed applicable industry standard or 80 pounds, whichever is less, under any operating condition, including initial breakaway. Provide gear reduction operator when force exceeds requirements.
   b. Operator self-locking type or equipped with self-locking device.
   c. Position indicator on quarter-turn valves.
   d. Worm and gear operators one-piece design worm-gears of gear bronze material. Worm hardened alloy steel with thread ground and polished. Traveling nut type operators threader steel reach rods with internally threaded bronze or ductile iron nut.

2. Exposed Operator:
   a. Galvanized and painted handwheels.
   b. Cranks on gear type operators.
   c. Chain wheel operator with tiebacks, extension stem, floor stands, and other accessories to permit operation from normal operation level.
   d. Valve handles shall have padlock, and wheels a chain and padlock.

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. Design buried service operators for quarter-turn valves to withstand 450 foot-pounds of input torque at the FULLY OPEN or FULLY CLOSED positions, grease packed and gasketed to withstand a submersion in water to 10 psi.
c. Buried valves shall have extension stems, bonnets, and valve boxes.

B. Electric Operators:

1. 120V Operator:
   a. General:
      1) Unit shall be low profile to reduce the amount of required space.
      2) Size to 1-1/2 times required operating torque. Motor stall torque not to exceed torque capacity of the valve.
      3) Provide controls integral with the actuator unless otherwise specified in the Power Operated Valve Schedule.
      4) Provide operator mounting bracket to mount operator to valve providing minimal torque to piping system when operating.
      5) NEMA 4X operator enclosure rating.
   b. Operator Operation-General:
      1) Suitable for full 90-degree rotation of quarter-turn valves.
      2) Manually override handwheel.
      3) Mechanical valve position indication.
      4) Operate from fully CLOSED to fully OPENED positions or the reverse in a maximum of 30 seconds unless otherwise shown in the Power Operated Valve Schedule.
   c. Electronic Control:
      1) Torque limiting switches two single pole—double throw mechanical switches. Switches operate at any point in valve travel.
      2) Jammed-valve detection and protection.
      3) Motor over-temperature detection and protection.
      4) Travel limit switches, single pole double throw.
   d. Type E1—Open-Close Service:
      1) The duty cycle for intermittent ON-OFF operation shall be 25 percent.
      2) Operator is power to OPEN and Power to CLOSE.
      3) Local Indication and Control:
         a) Integral mechanical valve POSITION indication, 0 to 100 percent OPENED.
         b) Integral OPENED and CLOSED indication lights.
         c) Integral LOCAL-OFF-REMOTE (LOR).
         d) Integral OPEN maintained switch which causes the valve to stroke full OPENED, even if the OPEN switch is released, while the LOR switch is in LOCAL.
         e) Integral CLOSE maintained switch which causes the valve to stroke full CLOSED, even if the CLOSED switch is released, while the LOR switch is in LOCAL.
4) Remote Indication and Control:
   a) Monitor relay that closes when the valve is capable of being controlled remotely (LOR switch in REMOTE, etc.) for connection to and monitoring by PICS.
   b) Limit switch that closes when the valve is fully OPENED for connection to and monitoring by PICS.
   c) Limit switch that closes when the valve is fully CLOSED for connection to and monitoring by PICS.

   e. Type E2—Modulating Service:
   1) Operator rated for continuous duty with servo shall be rated for 100 percent modulating operation.
   2) Operator shall modulate based on an externally applied 4 to 20 mA dc signal.
   3) Operator shall be equipped with an electronic servo module for valve modulation.
      a) Module shall provide serial communications with provided cable for setup of valve operation.
      b) Valve fail position is programmable as specified in the Power Operated Valve Schedule.

4) Local Indication and Control:
   a) Integral mechanical valve POSITION indication, 0-100 percent OPENED.
   b) Integral OPENED and CLOSED indication lights.
   c) Integral LOCAL-OFF-REMOTE (LOR).
   d) Integral OPEN momentary switch which causes the valve to stroke towards OPENED, as long as the OPEN switch is held, while the LOR switch is in LOCAL.
   e) Integral CLOSE momentary switch which causes the valve to stroke towards CLOSED, as long as the CLOSED switch is held, while the LOR switch is in LOCAL.
   f) Position valve proportionally 0 to 100 percent OPEN with external 4 to 20 mA dc signal while in REMOTE or from OPEN and CLOSE terminals for LOCAL operation.

5) Remote Indication and Control:
   a) Monitor relay that closes when the valve is capable of being controlled remotely (LOR switch in REMOTE, etc.) for connection to and monitoring by PICS.
   b) Limit switch that closes when the valve is fully OPENED for connection to and monitoring by PICS.
   c) Limit switch that closes when the valve is fully CLOSED for connection to and monitoring by PICS.
   d) Current Position Transmitter, 4 to 20 mA dc signal in proportion to 0 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 PICS.
f. Type E3—Open-Close, Fail-Safe Closed Service:
   1) The duty cycle for intermittent ON-OFF operation shall be 25 percent.
   2) Operator is Electro-Hydraulic power to OPEN, Spring to CLOSE, and Fail-Safe CLOSE.
   3) Local Indication and Control:
      a) Integral mechanical valve POSITION indication, 0 to 100 percent OPENED.
      b) Integral OPENED and CLOSED indication lights.
      c) Integral LOCAL-OFF-REMOTE (LOR).
      d) Integral OPEN maintained switch which causes the valve to stroke full OPENED, even if the OPEN switch is released, while the LOR switch is in LOCAL.
      e) Integral CLOSE maintained switch which causes the valve to stroke full CLOSED, even if the CLOSED switch is released, while the LOR switch is in LOCAL.
   4) Remote Indication and Control:
      a) Monitor relay that closes when the valve is capable of being controlled remotely (LOR switch in REMOTE, etc.) for connection to and monitoring by PICS.
      b) Limit switch that closes when the valve is fully OPENED for connection to and monitoring by PICS.
      c) Limit switch that closes when the valve is fully CLOSED for connection to and monitoring by PICS.
   5) Manual Override:
      a) Manual override wheel or hydraulic pump.
   6) Stroke Speed:
      a) Stroke speed shall be adjustable if both OPEN and CLOSE and Fail-Safe CLOSE directions
   7) Manufacturer and Product:
      a) Rotork Controls; Skilmatic SI-Q.
      b) Or approved equal.

h. Actuator Power Supply: 120V ac, single-phase unless otherwise indicated.

i. Enclosure:
   1) As defined in NEMA 4X.
   2) Contains 120-volt space heater.

C. Pneumatic Actuators:

1. General:
   a. Actuator complete with air sets, exhaust mufflers, speed controls, pilot solenoids, safety vented isolation valves, and accessories.
b. Suitable for full operation range of valve at air supply pressure indicated.
c. Actuators shall return valve to the closed position upon loss of signal unless otherwise indicated. Springs shall return valve to this failed position.
d. Limit switches on all actuators.

2. Cylinder Actuator:
   a. In compliance with AWWA C540.
   b. Air supply pressure of 80 psi.
   c. Nonswivel type totally enclosed:
      1) Travel stops and position indicator.
      2) Factory lubricated and sealed requiring no additional lubrication.
   d. Double Acting:
      1) Nonmetallic for operation on nonlubricated air.
      2) Handwheel override independent of cylinder.
   e. Spring Return:
      1) Open, closed, or throttling, steel cylinder with air line lubricators. Nonlubricated air may be used if certified by manufacturer.
      2) Modulating: Nonmetallic for operation on nonlubricated air.

3. Diaphragm Actuator:
   a. Spring return with steel or aluminum diaphragm case and spring barrel, steel spring and actuator stem, and fabric-reinforced neoprene diaphragm.
   b. Actuators used on quarter-turn valves shall include a totally enclosed valve actuating mechanism with adjustable travel stops and valve position indicator with manual override if indicated. Actuating mechanism factory lubricated and sealed.
   c. Diaphragm actuators sized and configured for the service indicated and an air supply pressure of 35 psig.
   d. Manufacturers and Products:
      1) Fisher Controls; Type 1051.
      2) Keystone Valve; Figure 723.

4. Accessories:
   a. Air Set: Pressure regulator with internal relief, filter, outlet pressure gauge, and adjustable reduced pressure range as required by the valve actuator.
      1) Aluminum body and handwheel.
      2) Safety vented lockout isolation valve.
      3) Gauge range 1-1/3 to 2 times maximum operating pressure.
   b. Manufacturers and Products:
      a) Fisher Controls; Type 67 AFR.
      b) Masoneilan; No. 77-4.
b. Air Exhaust Muffler:
   1) In the exhaust port of all actuator pilot solenoid valves.
   2) Manufacturers and Products:
      a) Barry Wright Corp.
      b) Allied Witan Co.

c. Limit Switch:
   1) Single-pole, double-throw (SPDT) type, rated 10 amps at 24V DC.
   2) Housed in NEMA 4X enclosure.
   3) Adjustable for OPEN and CLOSED valve positions.

d. Positioner:
   1) Positioner for modulating actuators shall be pneumatic force balance instruments to control valve position as a function of the input signal. Accomplish positive positioning of valve by a mechanical feedback connection from the valve actuating mechanism. Position feedback through a characterized linear cam to allow adjustment of valve positioning and input signal. Positioner suitable for double acting or spring return actuator.
   2) Positioner to have zero and span adjustment and be field reversible for direct or reverse action.
   3) Gauges for supply and output pressure and for input signal pressure.
   4) Positioner for 3 to 15 psig pneumatic input signal or 4 to 20 mA dc input signal as indicated.
   5) Positioner for dc input signal with transducers shall convert the electrical signal to the appropriate pneumatic signal. Transducer integral with the positioner or a separate component. If separate, factory mount transducer on the pneumatic operator. Line electric power not required for transducer.
   6) Corrosion-resistant enclosures for positioners and transducers to be splash- and moisture-proof with gasketed covers.

e. Pilot Solenoid Valve:
   1) Solenoid valve shall pilot control actuator in the appropriate configuration for type of open-close actuator being controlled. Double acting actuator shall have four-way solenoid valve, and spring return actuator shall have three-way solenoid valve. Dual coil valve shall not change position unless one coil is energized while the other is de-energized.
   2) Pilot operated diaphragm type solenoid valve with brass body and resilient seat. Valve with minimum operating pressure differential no greater than 10 psig and maximum operating pressure differential no less than 150 psig. Internal parts corrosion-resistant. Solenoid valve to have Class F molded coils for operation on 24V DC, unless otherwise indicated. Solenoid enclosure as defined in NEMA 250, Type 4X.
3) Manufacturers and Products:
   a) Asco Red Hat.
   b) C. A. Norgren Co.

5. Open-Close and Throttling Valve:
   b. Spring Return Cylinders: Three-way solenoids, spring return.

6. Modulating Valve: Positioner with 4 to 20 mA input signal unless otherwise indicated.

7. Control Features: Pneumatic actuators with features noted in the Pneumatic Actuator Schedule.

2.07 ACCESSORIES

A. Valve Tags:
   1. Provide rectangular 1-inch by 3.5-inch valve tag for each valve.
   2. Tag lettering shall be 1/2-inch height and 1/3-inch width with 1/16-inch spacing.
   3. Each valve tag shall be constructed of phenolic resin or comparable noncorrosive material and shall consist of white background with black lettering.
   4. Valve tags shall be with recessed lettering for valve number assigned to appropriate system designation.
   5. Valve tags shall be fastened to valve handle with "S" hook or “zip-tie” consisting of materials compatible with the valve body. Valve tags exposed to UV radiation shall be attached with materials resistant to UV radiation.
   6. Valves shall be numbered according to the P&IDs.
   7. The valve labeling system shall be the following:
      a. VXX-YXXX.
      b. The first letter indicating V for Valve.
      c. The second two characters are the valve number.
      d. The “Y” designates that the valve is part of the 200 West Pump and Treat System.
      e. The following two characters are the system number according to the Instrumentation and Controls numbering scheme identified in the Volume One of the Design Documents.
      f. The final character is the “skid” or “train” designator for such situation as required.
      g. Example:
         1) The valve on the membrane feed (MF) pipe leading into Aeration membrane tank A would be labeled:
            a) V01-Y50A

B. Limit Switch:
   1. Factory installed NEMA 4X limit switch by actuator manufacturer.
   2. SPST, rated at 5 amps, 24V DC.
C. T-Handled Operating Wrench:

1. Four galvanized operating wrenches, 4 feet long.
2. Manufacturers and Products:
   b. Clow No.; F-2520.
3. Four galvanized operating keys for cross handled valves.

D. 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.
   d. Or equal.

E. Cast-Iron Valve Box: Designed for traffic loads, sliding type, with minimum of 5-1/4-inch ID shaft.

1. Box: Cast iron with minimum depth of 9 inches.
2. Lid: Cast iron, minimum depth 3 inches, locking type, marked WATER.
3. Extensions: Cast iron, ABS, or PVC pipe.
4. Two-piece box and lid for valves 4 inches through 12 inches, three-piece box and lid for valves larger than 12 inches with base sized for valve.
5. Valve extension stem for valves with operating nuts 3 feet or greater below finish grade.
6. Manufacturers and Products:
   b. Bingham & Taylor; Cast-Iron Valve Boxes.

F. Concrete Valve Box: Designed for traffic loads, sliding type, with minimum of 10-inch ID shaft.

1. Box: High-density, reinforced concrete, minimum depth 12 inches, cast-iron ring seat.
2. Lid: Cast iron, minimum depth 3 inches, marked WATER.
3. Extensions: ABS, PVC, or cast-iron pipe.
4. Manufacturers and Products:
   a. Christy Concrete Products; G Series.
   b. BES Concrete Products; G Series.
G. Indicator Post Assembly:

1. Cast or ductile iron post head, bell, and wrench with cast or ductile iron or steel barrel.
2. Plexiglas or equal protected window to indicate OPEN and CLOSED position.
3. Padlockable eye bolt for wrench.
5. UL Listed and FM Approved.
6. Manufacturers and Products:
   a. Clow; Style 2945.
   b. Mueller; A-20806.

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 an elbow or branch tee and 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 a 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 horizontal or vertical flow (up) flow piping only for liquid services.
   b. Install valve in vertical flow (up) piping only for gas services.
   c. Install swing check valve with shaft in horizontal position.

E. Install a 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.

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 the depth of the valve operating nut is 3 feet or greater below finish grade, furnish an 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 6 inches above finish floor. Install chain to within 3 feet 0 inch 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 any 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 Buyer’s Technical Representative (BTR).

3.03 MANUFACTURER’S SERVICES

A. Manufacturer’s Representative: Present at Site for minimum person-days listed below, travel time excluded:

1. 1 person-day for installation assistance and inspection.
2. 1 person-day for functional and performance testing and completion of Manufacturer’s Certificate of Proper Installation.

B. See Section 01 43 33, Manufacturers’ Field Services, and Section 01 91 14, Equipment Testing and Facility Startup.