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| Version | Date | Description of Revisions |
| 1 | August 30, 2006 | Approved final document. |
| 2 | November 16, 2009 | Modified ‘Related Sections’ and approved suppliers |
| 3 | September 13, 2010 | Inserted typical approved suppliers for butterfly valves. Changed kpa to read kPa |
| 4 | March 16,2011 | Minor modifications |
| 5 | April 19,2011 | Modified approved suppliers, minor formatting changes |
| 6 | August 18, 2014 | First draft review comments (AV) |
| 7 | June 8, 2015 | Second Draft for Review (AV) |
| **8** | **September 16, 2015** | **Updated, Finalized Specification – Reference eDOCS #5823602-v4 (AV)** |
| 9 | March 16, 2016 | Addition of AWWA C512-15 (updated), AWWA C514-15 (new) and AWWA C516-14 (updated) (AV) |
| 10 | March 23, 2016 | Updated AWWA Specifications, added new subsection 2.6.7.7 Air Valve and Vent Inflow Preventer Assemblies aligned with AWWA C514-15 (AV) |
| 11 | May 10, 2016 | Removed Type V### designation, amended cited product list to remove duplication and error (AV) |
| 12 | March 1, 2017 | Updated for reference to NSF 372. (AV) |
| 13 | May 26, 2017 | Updated references to standards API STD 600 (July 2015), API STD 602 (Sept 2016), API STD 608 (Nov 2012), API STD 609(Apr 2017), ASME B16.1-2015, ASTM A216/A216M-16, ASTM A276/A276M-17, ASTM A351/A351M-16, ASTM A536-84 (2014), ASTM B61-15, ASTM B62-17, ASTM B139/B139M-12(2017), ASTM B194-15, AWWA C541-16, AWWA C542-16, MSS SP 81-2017, MSS SP 88-2015 (AAM) |
| 14 | August 16, 2017 | Complete reorganization of this spec, removing unnecessary items (CPD) |

NOTE:

This is a CONTROLLED Document. Any documents appearing in paper form are not controlled and should be checked against the on-line file version prior to use.

**Notice:** This Document hardcopy must be used for reference purpose only.

**The on-line copy is the current version of the document.**

# GENERAL

## Related Sections

### [Under "Related Sections", identify other Sections that are related to, and/or dependent on, the work results or information specified elsewhere. The list should be limited to Sections with specific information that the reader might expect to find in this Section, but is specified elsewhere. For example, if hardware for aluminum entrances is specified in the aluminum entrance Section, a cross-reference would be appropriate in the finish hardware Section. The purpose of this cross-referencing is for information only, to aid in finding those other requirements—not to define the scope of the Section.

### Cross-referencing here may also be used to coordinate assemblies or systems whose components may span multiple Sections and which must meet certain performance requirements as an assembly or system.

### Contractor is responsible for coordination of the Work.

### This Section is to be completed/updated during the design development by the Consultant. If it is not applicable to the section for the specific project it may be deleted.]

### [List Sections specifying installation of products supplied but not installed under this Section and indicate specific items.]

### Section [\_\_\_\_\_\_ – \_\_\_\_\_\_\_\_\_\_\_\_]: Execution requirements for ...[item]... specified under this Section.

### [List Sections specifying products installed but not supplied under this Section and indicate specific items.]

### Section [\_\_\_\_\_\_ – \_\_\_\_\_\_\_\_\_\_\_\_]: Product requirements for ...[item]... for installation under this Section.

### [List Sections specifying related requirements.]

### Section [\_\_\_\_\_\_ – \_\_\_\_\_\_\_\_\_\_\_\_]: [Optional short phrase indicating relationship].

#### Section 01300 - Submittals

#### Section 01640 - Manufacturers’ Services

#### Section 01810 – Equipment Testing and Facility Commissioning

#### Section 09900 – Painting and Protective Coatings

#### Section 15200 - Process Piping and Fittings

## References

*[Delete .1 if Section 01060 – Regulatory Requirements is included in Contract Documents.]*

### Comply with the latest edition of the following statutes, codes, and standards, and all amendments thereto:

#### American Petroleum Institute (API):

##### API STD 600 (July 2015), Steel Gate Valves-Flanged and Butt-welding Ends, Bolted Bonnets

##### API STD 602 (Sept 2016), Steel Gate, Globe, and Check Valves for Sizes NPS 4 (DN 100) and Smaller For the Petroleum and Natural Gas Industries

##### API STD 608 (Nov 2012), Metal Ball Valves-Flanged, Threaded and Welding Ends

##### API STD 609(Apr 2017), Butterfly Valves: Double-Flanged, Lug and Wafer Type.

#### American National Standards Institute (ANSI):

##### ASME B16.1-2015, Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.

#### American Society of Sanitary Consultants (ASSE):

##### ASSE 1011-2004, Performance Requirements for Hose Connection Vacuum Breakers.

#### American Society for Testing and Materials (ASTM):

##### ASTM A216/A216M-16, Standard Specification for Steel Castings, Carbon, Suitable for Fusion Welding, for High-Temperature Service

##### ASTM A126-04(2014), Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings

##### ASTM A276/A276M-17, Standard Specification for Stainless Steel Bars and Shapes.

##### ASTM A351/A351M-16, Standard Specification for Castings, Austenitic, for Pressure-Containing Parts

##### ASTM A536-84 (2014), Standard Specification for Ductile Iron Castings

##### ASTM A564/A564M-13, Standard Specification for Hot-Rolled and Cold-Finished Age-Hardening Stainless Steel Bars and Shapes

##### ASTM B61-15, Standard Specification for Steam or Valve Bronze Castings

##### ASTM B62-17, Standard Specification for Composition Bronze or Ounce Metal Castings

##### ASTM B98-B98M-13, Standard Specification for Copper Silicon Alloy Rod, Bar, and Shapes.

##### ASTM B127-05(2014), Standard Specification for Nickel-Copper Alloy (UNS N04400) Plate, Sheet, and Strip

##### ASTM B139/B139M-12(2017), Standard Specification for Phosphor Bronze Rod, Bar, and Shapes.

##### ASTM B164-03(2014), Standard Specification for Nickel-Copper Alloy Rod, Bar, and Wire.

##### ASTM B194-15, Standard Specification for Copper-Beryllium Alloy Plate, Sheet, Strip, and Rolled Bar

##### ASTM B584-14, Standard Specification for Copper Alloy Sand Castings for General Applications.

##### ASTM D429-14, Standard Test Methods for Rubber Property—Adhesion to Rigid Substrates

##### ASTM D1784-11, Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.

#### American Water Works Association (AWWA):

##### AWWA C111/A21.11-12, Rubber Gasket Joints for Ductile-Iron Pressure Pipe and Fittings

##### AWWA C500-09, Metal-Seated Gate Valves for Water Supply Service

##### AWWA C504-15, Rubber-Seated Butterfly Valves, 3In. (75 mm) Through 72 In. (1,800 mm).

##### AWWA C508-09, Swing-Check Valves for Waterworks Service, 2 In. Through 24 In.(50-mm Through 600-mm) NPS

##### AWWA C509-09, Resilient-Seated Gate Valves for Water Supply Service.

##### AWWA C510-07, Double Check Valve, Backflow Preventer Assembly.

##### AWWA C511-07, Reduced-Pressure Principle Backflow Prevention Assembly.

##### AWWA C512-15, Air-Release, Air/Vacuum, and Combination Air Valves for Waterworks Service.

##### AWWA C514-15, Air Valve and Vent Inflow Preventer Assemblies for Potable Water Distribution System and Storage Facilities.

##### AWWA C516-14, Large-Diameter Rubber-Seated Butterfly Valves, Sizes 78 In. (2,000 mm) and Larger.

##### AWWA C541-16, Hydraulic and Pneumatic Cylinder and Vane-Type Actuators for Valves and Slide Gates.

##### AWWA C542-16, Electric Motor Actuators for Valves and Slide Gates.

##### AWWA C550-13, Protective Interior Coatings for Valves and Hydrants

##### AWWA C606-15, Grooved and Shouldered Joints

##### AWWA C800-14, Underground Service Line Valves and Fittings

#### Manufacturers Standardization Society (MSS):

##### MSS SP 81-2017, Stainless-Steel or Stainless-Steel Lined, Bonnetless, Knife Gate Valves with Flanged Ends.

##### MSS SP 88-2015, Diaphragm Valves

#### NSF International (NSF):

##### NSF 61-2013: Drinking Water System Components—Health Effects.

##### NSF 372-2011: Drinking Water System Components – Lead Content

#### UL, ULC, UL/CSA

#### NEMA

##### Class F insulation

##### NEMA 250-2014, Enclosures for Electrical Equipment (1000 Volts Maximum)

#### University of Southern California (USC):

##### Foundation For Cross Connection Control and Hydraulic Research

#### The Chlorine Institute

##### Pamphlet 6) Piping Systems for Dry Chlorine (16th edition, March 2013)

## Measurement and Payment

*[Choose one of the following payment language provisions that best suits the individual project.*

*If this Section is not specifically referenced by an item in the Bid Form, please use the following language:*

.1 The work of this Section will not be measured separately for payment. All costs associated with the work of this Section shall be included in the Contract Price.

*OR If this Section is specifically referenced in the Bid Form, use the following language and identify the relevant item in the Bid Form:*

.1 All costs associated with the work of this Section shall be included in the price(s) for Item No(s). \_\_\_ in the Bid Form.

## If the work of this Section is to be measured and paid for by several different methods, please amend the standard wording given above to reflect the different methods of measurement and payment.]

## Submittals

### Shop Drawings, in accordance with Section 01300 - Submittals:

#### Product data sheets for make and model.

#### Complete catalog information, descriptive literature, specifications, and identification of materials of construction.

#### [Power and control wiring diagrams, including terminals and numbers.]

#### [Complete motor nameplate data.]

#### Sizing calculations for open close/throttle and modulating.

### Information Submittals, in accordance with Section 01300 - Submittals:

#### Certificate of Compliance for:

##### Electric operators; full compliance with AWWA C541-16 and AWWA C542-16.

##### Butterfly valves; full compliance with the requirements of AWWA C504-15.

##### API ANSI classes 300 and 600 valves; full compliance with API standards

#### Tests and inspection data

#### Manufacturer’s Certificate of Proper Installation.

#### Operation and Maintenance Manual.

##### API ANSI classes 300 and 600 valves; full compliance with API standards.

#### Certification of NSF 61 and NSF 372 compliance.

# PRODUCTS

## Approved Suppliers

### Actuator:

#### Rotork Controls (Canada) Ltd.

#### Flowserve Corporation (Limitorque Corporation).

#### Plast-O-Matic Valves, Inc.

#### AUMA Riester GmbH & Co. KGApproved Equivalent

### Altitude:

#### Cla-Val Canada Corporation.

#### Singer Valve Inc.

#### Approved Equivalent

### Backflow Preventer:

#### Watts Industries (Canada) Inc.

#### Conbraco Industries, Inc.

#### Approved Equivalent

### Ball Plastic:

#### Chemline Plastics Limited.

#### Chemcore Industries, Inc.

#### Approved Equivalent

### Weighted Lever Swing Check:

#### Val-Matic Valve and Manufacturing Corporation

#### Crane Canada Co.

#### Crane Canada Co. (Jenkins brand).

#### Approved Equivalent

### Flow Control:

#### Cla-Val Canada Corporation.

#### Singer Valve Inc.

#### Bermad Water Control Solutions

#### Approved Equivalent

### Flexible Disk Check:

#### Val-Matic Valve and Manufacturing Corporation

#### APCO Valve and Primer Corporation

#### Approved Equivalent

### Flexible (Duckbill):

#### Tideflex Technologies, A Division of Red Valve Company, Inc.

#### Approved Equivalent

### Globe:

#### Val-Matic Valve and Manufacturing Corporation

#### Crane Canada Co. (Jenkins brand).

#### Newman Hattersley Limited.

#### Crane Canada Co.

#### Approved Equivalent

### Knife Gate:

#### Trueline Valve Corporation.

#### Stafsjo Valves AB (Part of Broer Group Company).

#### Approved Equivalent

### Mud:

#### Clow Canada (A Division of McWane, Inc.).

#### DeZURICK Canada Inc.

#### Val-Matic Valve and Manufacturing Corporation

#### Troy Valve Machine Company (A Division of Penn-Troy Manufacturing, Inc.).

#### Approved Equivalent

### Pinch:

#### Elasto-Valve Rubber Products Inc.

#### Red Valve Company, Inc.

#### Approved Equivalent

### Plug:

#### DeZURICK Canada Inc.

#### Val-Matic Valve and Manufacturing Corporation

#### Approved Equivalent

### Pneumatic Actuator:

#### Bray International Inc.

#### Bettis Canada Ltd. (Part of Emerson Process Management)

#### APCO Valve and Primer Corporation

#### Approved Equivalent

### Solenoid Valve:

#### ASCO Valve Canada, Division of Emerson Electric Canada Ltd.

#### Barber Coleman

#### Johnson Controls LP

#### Jefferson Solenoid Valves USA Inc.

#### Approved Equivalent

### Air Valve and Vent Inflow Preventer Assemblies

#### [Consultant to provide names of approved products]

#### Approved Equivalent

### Air Release / Vacuum Breaker Valve

#### Val-Matic Valve & Mfg. Corp.

#### A.R.I. Flow Control Accessories Ltd.Approved Equivalent

### Tilting Disk Check Valve

#### APCO Valve and Primer Corporation

#### Approved Equivalent

### Telescopic Valves

#### Dynamic Water Control Gates Inc.

#### Approved Equivalent

## General

### All valves shall include the operator, actuator, hand wheel, chain wheel, extension stem, floor stand, worm and gear operator, operating nut, chain, wrench, and accessories for a complete operation.

### Valve shall be suitable for intended service. Renewable parts shall not to be of a lower quality than the specified in the Contract Documents.

### Valve shall be of the same size as adjoining pipe.

### Valve ends shall suit adjacent piping.

### Size operator to operate the valve for the full range of pressures and velocities

### All valves shall open by turning counterclockwise.

### Factory mount operator, actuator, and accessories

### Valves shall be compliant with NSF 61 and NSF 372 for potable water uses and conforming to recent lead content requirements for valves used in drinking water applications. *[Consultant to amend this subsection as required]*

## Schedule

### [Requirements relative to this section are shown on the [Electric Operator Schedule] [Pneumatic Operator Schedule] [Valve Schedule] located at the end of this Section.]

## Materials

### Brass and bronze valve components and accessories that have surfaces in contact with water shall be alloys containing less than 16 percent zinc and 2 percent aluminum.

#### Approved alloys are of the following ASTM designations: B61-15, B62-17, B98/B98M-13 (Alloy UNS No. C65100, C65500, or C66100), B139/B139M-12 (Alloy UNS No. C51000), B584 (Alloy UNS No. C90300 or C94700), B164-03(2014), B194-15, and B127-05(2014)

#### Stainless steel Alloy 18-8 may be substituted for bronze.

## Factory Finishing

### Epoxy Lining and Coating:

#### Use where specified in the Contract Documents for the individual valves described in this Section.

#### In accordance with AWWA C550-13 unless otherwise specified in the Contract Documents.

#### Either two parts liquid material or heat activated (fusion) material except that only heat activated material if specified as “fusion” or “fusion bonded” epoxy.

#### Minimum 0.18 mm dry film thickness except where limited by valve operating tolerances.

### Exposed Valves:

#### In accordance with Section 09900 – Painting and Protective Coatings.

#### Safety isolation valves and lockout valves with handles, hand-wheels, or chain wheels shall be “safety yellow.”

## Valves

### Gate Valves:

#### Gate Valve 75 mm and Smaller:

##### All bronze, screwed bonnet, single solid wedge gate, [non-rising stem][rising stem][outside screw and yoke], rated [862][1,035] kPa SWP, [1,207][1,380][2,070] kPa WOG.

##### [UL/ULC listed]

#### Iron Body Gate Valves Under 75mm: Iron body, bronze mounted, flanged ends, solid wedge gate, [non-rising bronze stem,][outside screw and yoke,] rated 862 kPa SWP, 1,380 kPa WOG.

#### Gate Valves 75 mm to 1200 mm for Water Service:

##### AWWA C500-09.

##### Iron body, bronze mounted, [flanged ends,] [push on ends,][ mechanical joint ends, ]double disc gate, [non-rising bronze stem,][rising bronze stem OS&Y,][ O-ring sealed stuffing box,][50 mm square wrench nut conforming to AWWA C500-09].

##### [Complies with ASME B16.1-2015]

##### Operator:

###### 50 mm to 350 mm Valves: Handwheel.

###### 350 mm and Larger Valves: [Handwheel,] [Spur gear,] [Bevel gear,] [Bypass valve,] [Roller tracks and Scrappers.]

##### Working Water Pressure:

###### 75 mm through 300 mm: [863][1,380][1,725] kPa

###### 350 mm and Larger: [863][1,035][1,725] kPa

#### Resilient Seated Gate Valves, 75 mm to 500 mm:

##### In accordance with [AWWA C509-15][AWWA C515-15], and fusion epoxy coated inside and out in accordance with AWWA C550-13

##### [NSF Standard 61 certified and NSF 372 certified]

##### [UL/ULC Listed ]

##### [Iron body][Ductile iron body], resilient seat, bronze mounted, [non-rising stem] [outside screw and yoke], [ANSI Class 125 flanged ends][mechanical joint ends], [50 mm operating nut] [hand-wheel operator], design working water pressure [1,035 kPa][1,375 kPa] [1,725 kPa], full port.

#### Gate Valves 75 mm to 300 mm for Fire Protection:

##### UL/ULC listed, iron body, bronze mounted, rising stem, outside screw and yoke, ASME B16.1-2015 flanged ends, rated 1,207 kPa WOG.

##### Double disc type gate, bronze wedge pins, parallel seat, gate stem in bronze bushing through stuffing box.

#### Indicator Post Valves 75 mm to 350 mm:

##### UL/ULC listed, iron body, bronze mounted, non-rising stem rated 1,207 kPa WOG, AWWA C111/A21.11 mechanical joint ends.

##### Double disc type gate, bronze wedge pins, parallel seat, gate stem sealed with double O-ring pressure and dirt seal.

##### Bolted flanged bonnet for mounting indicator post, indicator post to be locking type with an adjustable barrel and weather sealed indicator window to display OPEN and SHUT positions.

#### Knife Gate Valves 600 mm and Smaller:

##### Bonnet-less wafer body type, outside stem and yoke, rated for 1,035 kPa CWP minimum, ASME B16.1-2015 flanged ends, self-cleaning, non-clogging, with round port, resilient neoprene seat, drip tight shutoff.

##### Body and stem, Type 316 stainless steel, yoke sleeve bronze, gate finish ground both sides with a sharp knife edge.

##### 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.

##### In compliance with MSS SP 81-2013.

#### Knife Gate Valves 750 mm and Larger:

##### Bonnet-less wafer body type, outside stem and yoke, rated 345 kPa CWP minimum, hand-wheel or floor stand operator as required, self-cleaning, non-clogging, with round port, resilient neoprene seat, drip tight shutoff.

##### Body and stem Type 316 stainless steel, yoke sleeve bronze, gate finish ground both sides with a sharp knife edge.

##### 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.

#### API 600 Gate Valves:

##### ANSI Class [300][600] (sizes 50 mm 900 mm)

##### Shall be in full compliance with API 600 and 589, and following requirements:

###### Suitable for infrequent operation after periods of inactivity.

###### Connection, flanged design.

###### Outside stem and yoke

###### Carbon steel body in accordance with ASTM A216/A216M-1616, WCB. With interior and exterior epoxy coatings. 304 stainless steel flexible wedge to ASTM A351/A351M-16 CF8 with Stellite 6 hard surface, 304 stainless steel stem, 316 stainless steel shaft bearing and seat, graphite gland packing and seal.

###### Provide 25 mm bypass valve for valve size 250 mm and larger.

### Globe Valves:

#### Globe Valves 75 mm and Smaller:

##### All bronze, screwed ends, union bonnet, inside screw, rising stem, [TFE disc, ][plug type disc, ][replaceable stainless steel plug and seat, ]rated 1,035 kPa SWP, 2,070 kPa WOG.

#### Globe Valves Larger than 75 mm:

##### Iron body, bronze mounted, flanged ends, bronze seat, outside screw and yoke, bolted bonnet, rated 862 kPa SWP, 1,380 kPa WOG.

#### Needle Disc Type Globe Valves 3 mm to 19 mm:

##### Screwed or union bonnet, rising stem, bronze body and stem, rated 1,380 kPa SWP, 2,760 kPa WOG.

#### Angle Type Hose Valves 13 mm to 19 mm:

##### Bronze, angle sillcock type body, threaded or solder inlet as applicable, rating 863 kPa CWP.

#### Angle Type Hose Valve 19 mm:

##### 19 mm NPT female inlet, 19 mm male hose thread outlet, heavy rough brass body rated 863 kPa, lock-shield bonnet, removable handle, atmospheric vacuum breaker conforming to ASSE Standard 1011 and IAPMO code.

#### [Globe Style] [Angle Pattern] Hose Valves 25 mm to 75 mm:

##### All bronze, screwed ends, inside screw, rising stem, TFE disc, outlet of cast brass NHT by NPT, male by male, nipple adapter with hexagonal wrench feature, [brass cap with chain,] rated 2,070 kPa WOG.

### Ball Valves:

#### Ball Valves 50 mm and Smaller for General Water and Air Service:

##### [Two][Three]-piece end entry type, bronze body and end piece, hard chrome-plated bronze or brass ball, [full bore port, ]RTFE seats and packing, blowout-proof stem, zinc-coated steel hand lever operator with vinyl grip, rated 4,140 kPa WOG, 1,035 kPa SWP. [For steam service, provide stainless steel ball and stem.]

#### Ball Valves 50 mm and Smaller for Equipment Air System Shutoff:

##### Two-piece end entry type, bronze body and end piece, hard chrome-plated bronze or brass ball, RTFE seats and packing, blowout-proof stem, 4,140 kPa WOG, threaded ends, safety exhaust port to exhaust downstream side when valve is in closed position, zinc-coated steel latch-locking handle with vinyl grip.

#### Instrument Air Shutoff Valves 3 mm 19 mm:

##### [Brass] [Stainless steel] body ball valve, nylon handle.

#### Ball Valve 50 mms and Smaller for [LP Gas] [Natural Gas] [Fuel Oil] Service:

##### Two-piece bronze or forged brass body and end piece, threaded ends, hard chrome plated brass ball, RTFE seats and seal, blowout-proof stem, zinc-plated hand lever operator with vinyl grip, UL/CSA Listed [Guide YSDT for LP Gas] [Guide YRPV for natural gas] [Guide MHKZ for Fuel Oil], 4,140 kPa WOG, [UL Listed 1,725 kPa LP Gas].

#### Stainless Steel Ball Valves 50 mm and Smaller:

##### [Two][Three] piece ASTM A276-17 GR 316 or ASTM A351/A351M-16 GR CF8M stainless steel body and end piece, threaded ends, [standard port][full port], ASTM A276-17 Type 316 stainless steel ball, reinforced PTFE seats, PTFE packing, blowout proof stainless steel stem, stainless steel lever operator with vinyl grip, rated 10,350 kPa WOG, 1,035 kPa SWP.

#### Ball Valves for Chlorine Liquid and Gas:

##### 4,140 kPa WOG, carbon steel body, Monel ball and stem, reinforced Teflon seat, Teflon seals, double stem seal, lever operator, screwed ends, non-lubricated, and comply with the requirements of The Chlorine Institute Pamphlet 6 (16th edition, March 2013).

#### Vee-Ball Valves, 25 mm to 400 mm:

##### ANSI Class [1,035 kPa] [300 pound] valve with flanged ends, [carbon steel] [Type 317 stainless steel] body, heat treated nickel- or hard chromium-plated 317 stainless steel ball, splined-type 17-4 PH stainless steel shafts, reinforced PTFE flow-ring seal, reinforced PTFE with stainless steel or Hastelloy sleeve bearings, and PTFE V-ring packing. Valve to have 300:1 range-ability and equal percentage characteristic.

#### PVC Ball Valves 50 mm and Smaller:

##### Rated 1,035 kPa at 22.8 degrees Celsius, with ASTM D1784-11, 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.]

#### PVC Ball Valves 75 mm and 100 mm:

##### Rated 1,035 kPa at 22.8 degrees Celsius, with ASTM D1784-11 Type I, Grade 1 polyvinyl chloride 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 B16.1-2015ASME B16.1-2015. [Provide pressure relief hole drilled on low pressure side of ball.]

#### CPVC Ball Valves 50 mm and Smaller:

##### Rated 1,035 kPa at 38 degrees Celsius, 552 kPa at 60 degrees Celsius, in accordance with ASTM D1784-11, 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 B16.1-2015ASME B16.1-2015, 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.]

### Plug Valves:

#### Eccentric Plug Valves 50 mm and Smaller:

##### Non-lubricated type rated 1,208 kPa CWP, drip tight shutoff with pressure from either direction, cast iron body, threaded ends, lever operator, cast iron plug with round or rectangular port, plug coated with Buna N, stem bearing lubricated stainless steel or bronze, stem seal multiple V-rings, or U cups, or O-rings of nitrile rubber. Epoxy coated internal.

#### Eccentric Plug Valves 75 mm to 1200 mm:

##### Non-lubricated type rated 1,035 kPa CWP for 350mm valves and larger or 1,208 kPa CWP for 300 mm valves and smaller, drip tight shutoff with pressure from either direction, cast iron body, exposed service flanged ends in accordance with ASME B16.1-2015 [or grooved ends in accordance with AWWA C606-15 for rigid joints], buried service mechanical joints ends, unless otherwise shown on the Drawings, plug cast iron with round or rectangular port of no less than 80 percent,70 percent for valves 600 mm and larger, of connecting pipe area and coated with Buna N , seats welded nickel, stem bearing lubricated stainless steel or bronze, stem seal multiple V-rings or U-cups with O-rings of nitrite rubber, grit seal on stem.

##### Operators:

###### 75 mm Valves: Wrench lever manual

###### 100 mm to 1200 mm Valves: Totally enclosed, geared, manual operator with hand-wheel, 50 mm 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.

##### Provide internal and external epoxy coating.

#### Three Way, Non-lubricated, Tapered Plug Valves 75 mm to 400 mm:

##### Cast iron body with Buna N coated plug, multiple V-rings or U-cups with O-ring seals, lubricated stainless steel bearings, and nickel, rated 863 kPa CWP minimum, flanged in accordance with ASME B16.1-2015.

##### Operator: [Lever type.] [Gear type, totally enclosed and lubricated, with hand-wheel.]

#### Non-lubricated Plug Valves 50 mm and Smaller:

##### Ductile iron or carbon steel body, 316 stainless steel plug with straight way rectangular ports, Teflon sleeves, screwed ends, wrench operator.

##### Class: [150.] [300.]

##### Rating: [1897] [4968] kPa WOG.

#### Lubricated Plug Valve 63 mm to 350 mm:

##### Ductile iron or carbon steel body, 316 stainless steel plug with straight way rectangular ports, Teflon sleeves, flanged ends.

##### Class: [150.] [300.]

##### Rating: [1897] [4968] kPa WOG.

##### Operator:

###### 100 mm and Smaller Valves: Wrench type.

###### 150 mm and Larger Valve: Enclosed gear type.

#### Gauge Cocks 3 mm to 6 mm:

##### 6 mm bronze body, hexagon end pattern, tee head, male ends, rated 862 kPa SWP.

#### Corporation Stops 13 mm to 50 mm:

##### AWWA C800-12 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 25 mm and smaller rated 690 kPa, larger stops rated 552 kPa.

#### Buried Service Natural Gas Plug Valves 50 mm and Smaller:

##### UL/CSA listed, iron body type, rated 863 kPa, screwed ends, drilled key head for permanent pinned operating rod.

#### Combination Balancing and Shutoff Valves 50 mm and Smaller for Heating, Chilled, and Cooling Water Service:

##### Non-lubricated plug valve, cast iron or semi-steel body, wrench lever manual operator, [EPT] resilient plug facing, adjustable memory stop, rated [1,207][1,035] kPa WOG minimum, [screwed ends,][ two 3 mm flow taps][ ASME B16.1-2015 flanged ends].

### Butterfly Valves:

#### General:

##### Valves specified as AWWA C504-15 shall be in full compliance with AWWA C504-15 and the following requirements:

###### Suitable for throttling operations and infrequent operation after periods of inactivity.

###### Elastomer seats shall be field adjustable and replaceable.

###### Bubble tight with rated pressure applied from either side.

###### No travel stops for disc on interior of body.

###### Self-adjusting V type or O-ring shaft seals.

###### Isolate metal to metal thrust bearing surfaces from flow-stream.

###### Ductile iron disc with stainless steel disc edge.

###### NSF-61 and NSF 372 epoxy internal/external.

#### Butterfly Valves 75 mm to 1,830 mm:

##### [Flanged end, short body type][Mechanical joint end]

##### AWWA C504-15,

##### [150.] [75.] [25.] [A.] [B.] [Valve position indicator at valve box locations. Buried actuator sealed.]

##### Cast iron body, [cast or] ductile iron disc with [Type 316 stainless steel seating edge, ]Type [304][316] stainless steel shaft, [Buna N or NBR] [EPDM] rubber seat, and stainless steel seating surface. [NSF 61 and NSF 372 epoxy internal/external.]

##### [1,035] kPa working pressure rating.

#### Butterfly Valves High Pressure Service 75 mm to 1,200 mm:

##### Rated 1,725 kPa CWP at 4.87 m/s flow velocity, non-shock, watertight shutoff, conform to the requirements of AWWA C504-15 where applicable, suitable for throttling operations, suitable for infrequent use after extended periods of inactivity, body heavy cast or ductile iron, flanged ends, flange drilling in accordance with ASME B16.1-2015, Class [250] [125] disc cast or ductile iron with Type 316 stainless steel disc edge, shaft stainless steel ASTM A564/A564M-13, Type 630, Condition H 1100, [Buna N ] rubber seat, seals self-adjusting V type or O-rings, manufactured and tested in accordance with applicable requirements of AWWA C504-15. NSF 61 and NSF 372 epoxy internal/external.

#### Lug Style Butterfly Valves, Resilient Seated, 50 mm to 900 mm for Low Pressure Process Air Service:

##### [Lug][ Flanged] style cast iron body, stainless steel discs, Type [316][304] stainless steel one piece stem, self-lubricating sleeve type bearing, EPDM replaceable resilient seat suitable for operating temperatures up to 121 degrees Celsius, 1,035 kPa working pressure rating, bubble tight at 345 kPa differential pressure, valve body to fit between ANSI Class 125/150 flanges.

#### Lug Butterfly Valves 50 mm to 900 mm for Digester Gas:

##### Lug style, two-piece cast iron body, one-piece Type 316 stainless steel thin-profile disc and stem, heavy-duty stem bushing, NBR stem seal, FKM (Viton) replaceable resilient seat, 345 kPa pressure bi-directional bubble-tight rating, suitable for temperatures up to 121 degrees Celsius, valve body to fit between ANSI Class 125/150 flanges.

#### Butterfly Valves 50 to 500 mm (non AWWA C504-15):

##### [Wafer] [Lug] style, [cast iron] [ductile iron] body, [aluminum bronze] [ductile iron] [Type 316 stainless steel] disc, Type 316 or 18-8 stainless steel one-piece stem, [Buna N] [EPDM] [FKM (Viton)] replaceable resilient seat, heavy-duty self-lubricating sleeve type bushings, NBR stem seal, 1,035 kPa working pressure rating, valve body to fit between ANSI Class 125/150 flanges.

#### High Performance Butterfly Valves 50 mm to 915 mm:

##### ANSI Class [150] [300] [lug] [wafer] style, high performance type, [carbon steel] [Type 316 stainless steel] body, Type 316 stainless steel single or double offset disc, Type 316 stainless steel shaft and taper pins, [PTFE] [EPDM] [Buna N] seat, PTFE stem packing, stainless steel with RTFE thrust washer.

#### Solid Polyvinyl Chloride Butterfly Valves 38 mm to 200 mm:

##### Wafer body type, pressure rated 1,035 kPa at 21 degrees Celsius, CWP, solid ASTM D1784-11, Type I, Grade 1, PVC body and contoured PVC or polypropylene valve disc, stainless steel valve shaft, Viton seat, lever operator.

#### Butterfly Valves 100 mm to 500 mm for Fire Protection Service:

##### UL/CSA listed and Consultant approved, [wafer][flanged][mechanical joint] style, AWWA C504-15 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.

##### For buried service, provide post indicating assembly with detachable crank handle.

##### Acceptable Manufacturers:

###### *[Consultant to provide names of three approved products]*

###### Henry Pratt Company

###### Approved Equivalent

### Check and Flap Valve:

#### Check Valves, 50 mm and Smaller:

##### All bronze, threaded cap, threaded [or soldered] ends, swing type replaceable [bronze disc][ Teflon disc and bronze disc holder], rated [862][1,035] kPa SWP, [1,380][2,070] kPa WOG.

#### Check Valves 63 mm to 300 mm:

##### Flanged end, cast iron body, bronze mounted swing type, solid bronze hinges, stainless steel hinge shaft, [outside lever and [weight,] [spring,]] rated 862 kPa SWP, 1,380 kPa WOG.

#### Swing Check Valves 50 mm to 600 mm:

##### AWWA C508-09, 125-pound flanged ends, cast iron body, bronze body seat, bronze mounted cast iron clapper with [bronze seat] [rubber facing], stainless steel hinge shaft.

##### Valves, 50 mm through 300 mm rated 1,207 kPa and 350 mm through 600 mm rated 1,035 kPa CWP, non-shock. Valves to be [plain fitted] [fitted with adjustable outside lever and weight] [fitted with adjustable outside lever and spring] [fitted with dual adjustable outside levers and springs]. Increasing pattern body valve may be used where increased outlet piping size is shown.

#### Swing Check Valves 63 mm to 300 mm for Fire Protection Service:

##### UL/CSA listed and Consultant approved, iron body, bronze mounted, rated 1,207 kPa WOG, self-adjusting bronze disc, ends ASME B16.1-2015 flanged, with a 25 mm NPT tapped and plugged boss.

#### Double Disc Swing Check Valves 50 mm to 1,200 mm:

##### Wafer style, spring loaded, cast iron body, aluminum bronze or ductile iron discs, Buna N resilient seats, and Type 316 stainless steel spring, hinge pin, and stop pin.

##### Valves 50 mm through 300 mm rated 1,380 kPa non-shock working pressure and valves 350 mm through 1,200 mm rated 1,035 kPa non-shock working pressure.

#### Slanting or Tilted Disc Check Valves 50 mm to 1,500 mm:

##### Slanting or tilting disc design, off centre pivot, body ductile iron two piece design, bronze seat on 55 degree angle, disc bronze or ductile iron, pivot pin and bushing Type 304 stainless steel[ or bronze], Class [125][250], [1,035][2,070] kPa rating, Class [125][250] flange drilling, [bottom mounted buffer cylinder for cushion closing] [valve disc position indicator].

#### Slanting Disc Check Valves 50 mm to 900 mm:

##### Off centre pivoting disc design, wafer style, cast iron body, ductile iron discs, Type 316 stainless steel pivot pin, spring pin, and bushing, Buna N disc seal, Type 316 stainless steel or Monel spring, [Class 125][Class 250].

#### Wafer Style Check Valves 50 mm to 915 mm:

##### Wafer style, swing check, one piece body design, full resilient seal in machined body groove. [Cast iron] [Carbon steel] [Type 316 stainless steel] body, ASME Class [125] [150] [300] rating, Type 316 stainless steel disc, Type 316 stainless steel spring and other internals, Buna N seal, [outside lever assembly] [outside lever and weight assembly], [limit switch assembly], [external] [and internal epoxy coating].

#### Silent Check Valves 50 mm to 600 mm:

##### [Wafer][Globe] style, iron body, centre guided valve, bronze trim, [862 kPa flanges, ][Buna N seat,] stainless steel springs, rated 1,035 kPa WOG.

#### Silent Check Valves 100 mm to 300 mm for Fire Protection Service:

##### UL/CSA listed and Consultant approved, centre guided [wafer style valve,] [globe style valve with ASME B16.1-2015, Class 125 flanges,] iron body, bronze trim, stainless steel spring, rated 1,207 kPa non-shock, CWP.

#### PVC Ball Check Valves 100 mm and Smaller:

##### ASTM D1784-11, Type I, Grade 1 polyvinyl chloride body, dual union socket weld ends, rated 1,035 kPa at 22 degrees Celsius, and Viton seat and seal.

#### CPVC Ball Check Valves 100 mm and Smaller:

##### ASTM D1784-11 Cell Class 23477B chlorinated polyvinyl chloride body, single or dual union socket weld ends, rated 1,035 kPa at 23 degrees Celsius, 759 kPa at 60 degrees Celsius, Viton seat and seal.

#### Rubber Flapper Check Valves 50 mm to 600 mm:

##### Iron body, ASME B16.1-2015, Class 125 flanges, steel reinforced Buna N flapper raised seating ring, rated 1,035 kPa CWP c/w plug on cover and body to be able to install indicator or backflow actuator.

#### Double Check Valves Backflow Prevention Assembly 19 mm to 250 mm:

##### Two resilient seated check valves, two [non-rising stem] [outside screw and yoke] resilient seated isolation valves, test cocks, in accordance with AWWA C510-07, rated 1,208 kPa maximum working pressure, meets requirements of USC Foundation For Cross Connection Control and Hydraulic Research. *[Consultant to confirm applicability of this reference]*

#### Reduced Pressure Principle Backflow Prevention Assembly 19 mm to 250 mm:

##### Two resilient seated check valves with an independent relief valve between the valves, two [non-rising stem] [outside screw and yoke] resilient seated isolation valves, test cocks, in accordance with AWWA C511-07, rated 1,208 kPa maximum working pressure, meets requirements of USC Foundation For Cross Connection Control and Hydraulic Research. *[Consultant to confirm applicability of this reference]*

#### Wet Pipe Alarm Valve:

##### Valve and Trim:

###### UL/CSA Listed and Consultant approved as a complete unit, rated 175 psi working pressure, [125 pound ASME B16.1-2015 flanged inlet] [and] [outlet] [grooved end outlet].

###### Supplied with full trim for [horizontal flow] [vertical flow] [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.

###### Provide with additional valves, piping, and fittings as required for a complete and fully functioning arrangement.

#### Check Valves 50mm and Smaller for Fuel Oil Service:

##### Forged steel, lift check type integral seat, stainless steel disc, screwed ends, rated 5,520 kPa at 454 degrees Celsius.

#### Check Valves 50 mm and Smaller for Heating, Chilled, and Cooling Service:

##### All bronze type silent check valve, screwed ends, rated 1,380 kPa WOG.

#### Flap Gate 450 mm and Larger:

##### Cast iron body, bronze mounted, flanged frame type, dual pivot point hinge arms, hinge arms bronze, hinge pins Type 304 stainless steel, seat bronze and impacted into grooves in body and cover flap, lubrication fittings for each pivot, Type 316 stainless steel anchor bolts or cast iron wall thimble.

##### [Shop coat embedded surfaces of thimble with System No. 2 as specified in Section 09900 – Painting and Protective Coatings.]

#### Flap Valves 100 mm to 400 mm:

##### Flanged frame, iron body, fully bronze mounted with bronze hinge pin and seat.

#### Check Valves 25 mm to 1,200 mm:

##### Elastomer type flanged or slip on, round entry area to match pipe, contoured duckbilled shaped exit, valve open with approximately50 mm of line pressure and return to CLOSED position under zero flow condition, flanged, rated for 345 kPa minimum operating pressure; flanges steel backing flange type, drilled in accordance with ASME B16.1-2015ASME B16.1-2015, Class 125, plain end valve attached with two Type 316 stainless steel adjustable bands, elastomer nylon reinforced [neoprene], curved bill.

### Self-Contained Automatic Valves:

#### Pressure Reducing Valves 63 mm and Smaller:

##### Direct diaphragm operated, spring controlled, [bronze][cast iron] body[, spring case][, composition seat and diaphragm][, stainless steel valve stem].

##### Size/Rating: [ ] mm, maximum of [ ] L/m, with inlet pressure of [ ] kPa. Outlet pressure set at [     ] kPa. [As shown in the Valve Schedule.]

#### Pressure Reducing/Back Pressure Sustaining Valves 75 mm and Larger:

##### Hydraulically operated, diaphragm actuated, pilot controlled globe valve, ductile iron, or steel body, rated 1,208 kPa, ASME B16.1-2015 flanged ends, stainless steel stem, externally mounted strainers with cocks.

###### Pressure Reducing: bronze or stainless steel trim and maintain a constant downstream pressure regardless of fluctuations in flow or upstream pressure.

###### Back Pressure Sustaining: stainless steel trim, and maintain a constant downstream pressure while maintaining a minimum upstream pressure.

##### [NSF 61 and NSF 372 approved fusion bonded epoxy lining [and coating] installed in accordance with AWWA C550-13.]

##### Size/Rating: [     ] mm, maximum of [     ] L/s, with inlet pressure of [     ] kPa (gauge). Outlet pressure set at [     ] kPa (gauge). [As shown in the Valve Schedule.] *[Consultant to append Valve Schedule]*

#### Pressure Relief Valves 50 mm and Smaller:

##### Direct diaphragm, spring controlled, [cast iron] [     ] body, [     ] spring case, [nitrile] [     ] seat [neoprene] [     ] diaphragm, stainless steel valve stem.

##### Capable of opening when upstream pressure reaches a maximum set point.

##### Size/Rating: [     ] mm, maximum of [     ] L/s, with inlet pressure of [     ] kPa (gauge). Outlet pressure set at [     ] kPa (gauge). [As shown in the Valve Schedule.] *[Consultant to append Valve Schedule]*

#### Pressure Relief Valves 75 mm and Larger:

##### Hydraulically operated, diaphragm actuated, pilot controlled globe valve, ductile iron, or steel body, ASME B16.1-2015 flanged ends, rated 1,208 kPa, stainless steel trim, stainless steel stem, externally mounted strainers with cocks, to open when upstream pressure reaches a maximum set point.

##### [NSF 61 and NSF 372 approved fusion bonded epoxy lining [and coating] installed in accordance with AWWA C550-13.]

##### Size/Rating: [     ] mm, set point of [     ] kPa (gauge). [As shown in the Valve Schedule.] *[Consultant to append Valve Schedule]*

#### Air Valve and Vent Inflow Preventer Assemblies in accordance with AWWA C514-15 (for water distribution/storage system applications susceptible to flooding and requiring prevention of entry of contaminated water into potable water systems).

##### [Consultant to provided requirements and constraints]

#### Air and Vacuum Valves 13 mm to 400 mm:

##### 13 mm through 75 mm NPT inlets and outlets, 100 mm and larger ASME B16.1-2015 [Class 125] [Class 250] flanged inlet with plain outlet and protective hoods.

##### Rated [1,035] [2,068] kPa working pressure, cast iron or ductile iron body and cover, stainless steel float and trim, built and tested to AWWA C512-15. [Operating pressure is [ ] kPa.] Fusion bonded epoxy NSF 61 and NSF 372 internal/external.

#### Air and Vacuum Valves 100 mm to 400 mm with Anti-Slam Device:

##### Equipped 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. NSF 61 and NSF 372 fusion bowled epoxy internal/external.

##### Rated [1,035 kPa] [2,068 kPa] working pressure, cast iron or ductile iron body and cover, stainless steel float and trim, built and tested in accordance with AWWA C512-15, ASME B16.1-2015 [Class 125] [Class 250] flanged inlet and plain outlet with protective hood.

##### [Provide air release valve and isolation gate valve to meet rated working pressure. Operating pressure is [ ].]

#### Air and Vacuum Valves 13 mm to 400 mm for Vertical Turbine Service:

##### 13 mm through 75 mm equipped 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.

##### 100 mm and larger equipped 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 B16.1-2015 [Class 125] [Class 250] flanged inlet and NPT threaded outlet. Fusion bonded epoxy internal/external NSF 61 and NSF 372.

##### Rated [1,035 ] [2,068] kPa working pressure, cast iron, ductile iron body and cover, stainless steel float and trim, built and tested in accordance with AWWA C512-15.

#### Air Release Valves 13 mm to 150 mm:

##### 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.

##### Rated [1,035][2,068] kPa working pressure, cast iron, ductile iron body and cover, stainless steel float and trim, NPT threaded inlet and outlet, built and tested to AWWA C512-15. [Operating pressure is [     ] kPa.]

#### Combination Air Release Valves 25 mm to 400 mm:

##### Suitable for water service, combines the operating features of both an air and vacuum valve and air release valve. Air and vacuum portion shall automatically exhaust air during filling of system and allow air to re-enter during draining or when vacuum occurs. The air release portion shall automatically exhaust entrained air that accumulates in the system.

##### Rated [1,035][2,068] kPa working pressure, cast iron, ductile iron body and cover, stainless steel float and trim, built and tested to AWWA C512-15.

##### Valve single body or dual body, air release valve mounted on air and vacuum valve, isolation valve mounted between the dual valves. 25 mm through 75 mm valves with NPT threaded inlet and outlet, 100-mm and larger valves with ASME B16.1-2015 [Class 125][Class 250] flanged inlet and cover outlet.

#### Sewage Air and Vacuum Valves 50 mm to 350 mm:

##### Suitable for sewage service; automatically exhausts air during system filling and allows air to re-enter during draining or when vacuum occurs.

##### Rated Working Pressure: 1,035 kPa, 25 mm through 75 mm valves with NPT threaded inlet and outlet, 10 mm (4 inch) and larger valves with ASME B16.1-2015ASME B16.1-2015 Class 125 flanged inlet and threaded cover outlet, built and tested in accordance with AWWA C512-15.

##### Materials: Cast iron, ductile iron, or semi steel body and covers, with concave or skirted stainless steel float and trim; Buna N seat.

##### [Sewage air and vacuum valve fitted with blow off valve, flushing valve with quick disconnect couplings, and a minimum of 1.6 metres of hose with quick disconnect couplings to permit back flushing after installation without dismantling the valve.]

#### Sewage Air Release Valves 50 mm to 100 mm:

##### Suitable for sewage service; automatically exhausts entrained air that accumulates in a system.

##### Rated Working Pressure: 1,035 kPa, operating pressure of [     ], built and tested in accordance with AWWA C512-15.

##### Materials: Cast iron, ductile iron body and cover with NPT threaded inlet and [13 mm] [25 mm] NPT threaded outlet, concave or skirted stainless steel float and trim; Buna N resilient seat.

##### [Sewage air release valve fitted with blow-off valve, flushing valve with quick disconnect couplings, and a minimum of 1.6 metres of hose with quick disconnect couplings to permit back flushing after installation without dismantling valve.]

#### Sewage Combination Air Valve 50 mm to 150 mm:

##### 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 shall automatically exhaust entrained air that accumulates in the system. Single body unit with air and vacuum valve and an air release valve in a single housing.

##### Rated Working Pressure: 1,035 kPa built and tested in accordance with AWWA C512-15.

##### Materials: Cast iron or ductile iron body and covers, NTP inlet and outlet, with concave or skirted stainless steel float and trim.

##### [Sewage air release valve fitted with blow off valve, flushing valve with quick disconnect couplings, and a minimum of 1.6 metres of hose with quick disconnect couplings to permit back flushing after installation without dismantling the valve.]

#### Sewage Combination Air and Vacuum Valves 150 mm to 350 mm:

##### Suitable for sewage service; combines the operating functions of both an air and vacuum valve and an air release valve using separate valves connected together. The air and vacuum valve shall automatically exhaust large quantities of air during system filling and allow air to re-enter during draining or when a vacuum occurs. Air release valve shall automatically exhaust small quantities of entrained air that accumulates in the system.

##### Materials: Cast iron or Ductile Iron Body:

###### Air and Vacuum Valve:

Upper and lower concave or skirted stainless steel float and trim.

Inlet Flanges: ASME B16.1-2015ASME B16.1-2015, Class [125] [250] pound.

Outlet: [Hooded.] [Flanged.]

Seat: Buna N.

2. Air Release Valve: 50 mm NPT inlet and 13 mm NPT threaded outlet; Buna N seat.

##### Provide with all bronze blow-off and flushing gate valves for each valve, all bronze isolation gate valve between the air and vacuum valve and the air release valve; 1.6 metre rubber hose with quick disconnect couplings.

##### [Provide with inlet NRS AWWA compliant gate isolation valve or plug valve.]

#### Sewage Rolling Seal Combination Air Valves 19 mm to 200 mm:

##### Designed for sewage service and uses rolling seal to allow smaller and larger amounts of air to automatically exhaust under pressure and air to enter when a vacuum occurs all in a single valve body. Body designed to allow sewage solids to flow out of valve.

##### [Stainless steel] [Cast iron] funnel shaped body with ASME B16.1-2015ASME B16.1-2015, Class 125 flanged inlet and access flanges, reinforced nylon combination air and vacuum valve assembly and polypropylene discharge elbow, 1,585 kPa working pressure, all bronze drain/flush valve.

##### Foamed polypropylene float, EPDM rubber rolling seal mechanism with reinforced nylon plug, plug cover, and clamping stem, Buna N O-ring.

#### Dual Chamber Booster Pump Control Valves 63 mm to 400 mm:

##### Hydraulically operated, diaphragm actuated, pilot controlled globe valve with, ductile iron, or steel body, ASME B16.1-2015ASME B16.1-2015 flanged ends, rated 1,208 kPa, stainless steel trim, stainless steel stem, externally mounted strainer with cock. Designed to eliminate pipeline surge caused by pump startup and shutdown with an automatic check valve feature.

##### [NSF 61 and NSF 372 approved fusion bonded epoxy lining [and coating] installed in accordance with AWWA C550-13.]

#### Deep Well Pump Control Valves 63 mm to 400 mm:

##### Hydraulically operated, diaphragm actuated, solenoid controlled globe valve with, ductile iron, or steel body, ASME B16.1-2015ASME B16.1-2015 flanged ends, rated 1,208 kPa, stainless steel trim, stainless steel stem, and externally mounted strainer with cock. Designed to eliminate pipeline surges caused by starting and stopping deep well pumps by discharging to waste.

##### [NSF 61 and NSF 372 approved fusion bonded epoxy lining [and coating] installed in accordance with AWWA C550-13.]

### Miscellaneous Valves:

#### Iron Body Diaphragm Valves, 13 mm to 300 mm:

##### [Straight through][Weir] type, [polypropylene lined] [hard rubber lined] [    lined] cast iron body, ASME B16.1-2015 flanged ends, manual operator indicating, rising stem type with hand wheel, diaphragm [ethylene propylene,] [neoprene,] [Buna N,] in accordance with MSS SP-88-2010, Category B.

#### Plastic Body Diaphragm Valves, 13 mm to 100 mm:

##### Weir type with [PVC Type 1, Grade 1] [CPVC Type 4, Grade 1], [PVDF] body, [Viton (FKM) diaphragm] [PTFE with EPDM backing diaphragm [PTFE with EPDM or Viton backing and with PVDF gas barrier diaphragm], [double union design, solvent weld socket ends] [flanged ends], hand wheel operator, position indicator, adjustable travel stop, clear molded acrylic stem cap.

#### Pinch Valves 50 mm to 300 mm:

##### Cast iron, fully enclosed body, epoxy lined and coated, with ASME B16.1-2015ASME B16.1-2015 Class 125 flanged ends, one piece molded Buna N elastomer tube, 621 kPa minimum working pressure, double acting upper and lower pinch bars that close on centreline, non-rising hand wheel operator.

#### Telescoping Scum Collection Valve:

##### Rack and pinion type with offset floor stand and cast iron offset floor stem incorporating the rack guides, pinion, and hand wheel supports. Rack and pinion and connecting rods Type 304 stainless steel, slip pipe brass with flat weir crest skimming funnel, cast iron pipe companion flange, O-ring seal and gasket for connection to discharge pipe. Skimming funnel minimum top diameter of 200 mm.

##### Valve, 100 mm nominal and continuously adjustable from a high point of [1.5] [     ] feet below the bottom of the floor stand to a low point [5.50] [     ] feet below the bottom of the floor stand.

##### Anchor Bolts: Type 316 stainless steel.

#### Mud Valve:

##### Cast iron body tapered seat, bronze disc and seat ring, frame flanged, non-rising type stem, bronze extension stem, 50 mm square operating nut for floor box operation, and stem guides for maximum unsupported stem length of 1.6 metres.

#### Sampling Valves:

##### 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, [19 mm NPT inlet and 19 mm NPT outlet] [25 mm NPT inlet and 25 mm NPT outlet].

#### [Fire Hydrant:] *[Consultant to amend with Region of York’s standard for fire hydrant if applicable.]*

#### Solenoid Valves 6 mm to 50 mm:

##### 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 in the Contract Documents. Solenoid enclosure NEMA 250, Type 4 unless otherwise indicated in the Contract Documents. Size and normal position [(OPEN [or CLOSED] when de-energized)] as indicated in the Contract Documents.

##### Minimum operating pressure differential no greater than 35 kPa (gauge), maximum operating pressure differential not less than 863 kPa (gauge).

#### Altitude Valves 75 mm and Larger:

##### Hydraulically operated, diaphragm actuated, pilot controlled globe valve, ductile iron, body, ANSI Class 300, ASME B16.1-2010 flanged ends, stainless steel trim, stainless steel stem, externally mounted strainers with cocks, and maintain a constant downstream pressure while maintaining a minimum upstream pressure.

##### One way flow

##### NSF 61 and NSF 372 (as applicable) approved fusion bonded epoxy lining and coating installed in accordance with AWWA C550-13.

##### Size/Rating: As shown in the Valve Schedule. *[Consultant to append the Valve Schedule]*

#### Rotary Pump Control Valves

##### Cast steel body ASTM A216/A216M-16, WCB for 25 and 40 Bar pressure, Cast iron ASTM A126/A126-04(2014) Class B or ductile iron ASTM A536-84(2009) for less than 16 Bar pressure. ANSI 125 or 250 for cast iron and ductile iron flanges. ANSI 300 steel flanges for cast steel body. Body assembly with full unrestricted, circular inlet and out let opening equal to the rated size of the valve. Bonze or stainless steel body seat ring with UHMW seat. Body shall include body mounting pad. Provide valve position indicator.

##### Ductile or cast steel rotor with integral trunnions with stainless steel shaft. Bearing shall be bronze of stainless steel.

##### Valve operator and control-water hydraulic cylinders with electric solenoid pilot control valves. All control tubing fitting, pilot valves, pressure reducing valve, manual valves, strainer shall be pre-piped. Hydraulic cylinders shall be plated cast iron/ductile iron bronze or non-corrosive material, piston rods shall be stainless steel. Water from piping at pipeline pressure shall be used for the operator. Provide pressure reducing valve as required to step-down the water control pressure. Provide pressure switch and limit switch as required. Provide NEMA 4 control panel for each valve operator. The hydraulic operator shall include a hand wheel manual override operator.

##### Pump control valve operation: the pump control valve shall be controlled by its control panel and interlock to the pump control.

##### Valve Opening

###### When pump start button is pushed, normal solenoid pilot and emergency solenoid valves energized when pump discharge pressure switch mounted on the pump discharge valve reach a preset value.

###### If the pump failed to reach the preset pressure value in a preset time interval, the solenoid pilot valves will be closed.

###### When control valve is fully open and valve limit switch locks in the power supply to the pilot solenoid valves for continuous pump operation.

##### Valve closing

###### When pump stop button is pushed, normal pilot solenoid valve de-energized but pump and emergency pilot solenoid valve remain energized.

###### As pump control valve near its seat, the valve limit switch opens and de-energized the pump and emergency pilot solenoid valve.

##### Power failure. The emergency pilot and normal pilot solenoid valves are de-energized. The emergency closing speed is faster than the normal closing speed.

## Operators

### Manual Operator:

#### General:

##### Operator force shall not exceed 18 daN under any operating condition, including initial breakaway. Gear reduction operator when force exceeds 18 daN.

##### Operator self-locking type or equipped with self-locking device.

##### Position indicator on quarter turn valves

##### Worm and gear operators shall be one piece design worm gears of gear bronze material. Worm hardened alloy steel with thread ground and polished. Traveling nut type operators shall be threaded steel reach rods with internally threaded bronze or ductile iron nut.

#### Exposed Operator:

##### Galvanized and painted handwheels.

##### Lever operators allowed on quarter turn valves 200 mm and smaller.

##### Cranks on gear type operators.

##### Chain wheel operator with tiebacks, extension stem, floor stands, and other accessories to permit operation from normal operation level.

##### Valve handles to take a padlock, and wheels a chain and padlock.

#### Buried Operator:

##### Buried service operators on valves larger than 63 mm shall have a 50mm AWWA standard *[Consultant to cite AWWA Standard reference]* compliant operating nut. Buried operators on valves 50 mm 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.

##### Design buried service operators for quarter turn valves to withstand 610 Newton-meter of input torque at the FULLY OPEN or FULLY CLOSED positions, grease packed and gasketed to withstand a submersion in water to 69 kPa.

##### Buried valves shall have extension stems, bonnets, and valve boxes.

### Electric Operator:

#### General:

##### Comply with the requirements of AWWA C542-16AWWA C542-16.

##### Size to 1.5 times the required operating torque. Motor stall torque shall not exceed torque capacity of valve.

##### Controls integral with the actuator and fully equipped as specified in AWWA C542-16

##### Stem protection for rising stem valves.

#### Actuator Operation General:

##### Suitable for full 90 degree rotation of quarter turn valves or for use on multi-turn valves.

##### Manually override hand-wheel.

##### Valve position indication.

##### Operate from FULL CLOSED to FULL OPEN positions or the reverse in the number of seconds given in the Electric Operator Schedule. *[Consultant to insert Electric Operator Schedule]*

#### Open Close/Throttling Service:

##### Size motors for one complete OPEN CLOSE OPEN cycle a minimum of once every 10 minutes.

##### Actuator suitable for throttling operation of valve at intermediate positions.

##### Integral OPEN STOP CLOSE pushbutton controls.

##### OPEN and CLOSED indicating lights.

##### Reversing motor starter with built in overload protection.

#### Modulating Service:

##### Size motors for continuous duty.

##### Feedback potentiometer and integral electronic positioner/comparator circuit to maintain valve position.

##### HAND OFF AUTO (Local Off Remote) Selector Switch:

###### OPEN STOP CLOSE pushbutton to control valve in HAND position.

###### 4 to 20 mA dc input signal to control valve in AUTO position.

###### Auxiliary contact that closes in REMOTE position.

##### Valves shall close upon loss of signal unless otherwise indicated in the Contract Documents.

##### OPEN and CLOSED indicating lights.

##### AC motor with reversing starter or DC motor with solid state reversing controller, and built in overload protection. Controller must be capable of 1200 starts per hour.

##### Duty cycle limit timer and adjustable band width shall prevent actuator hunting.

##### Valve position output converter that generates a 4 to 20 mA dc signal in proportion to valve position, and which is capable of driving into loads up to 500 ohm at 24 volts dc.

#### Actuator Power Supply:

##### 570 volt, three phase unless otherwise indicated in the Contract Documents.

##### Control power transformer, 120 volt secondary.

##### Externally operable power disconnect switch.

#### Enclosure:

##### As defined in NEMA 250, Type 4.

##### Contain 120 volt space heaters.

#### Limit Switch:

##### Single pole, double throw (SPDT) type, field adjustable cam operated, with contacts rated for 5 amps at 120 volts ac.

##### Each valve actuator to have a minimum of two transfer contacts at end position, one for valve FULL OPEN and one for valve FULL CLOSED.

##### Housed in actuator control enclosure.

#### Control Features: Electric actuators with features noted in the Electric Operator Schedule.

### Pneumatic Operator:

#### General:

##### Complete with actuators, air sets, exhaust mufflers, speed controls, pilot solenoids, safety vented isolation valves, and accessories.

##### Suitable for full operation range of valve at air supply pressure indicated.

##### Actuators shall return valve to the closed position upon loss of signal unless otherwise indicated in the Contract Documents. Springs shall return valve to this failed position.

##### Limit switches on all actuators.

#### Cylinder Actuator:

##### In compliance with AWWA C541-16.

##### Air supply pressure of [552 kPa.] [     ].

##### Non-swivel type totally enclosed:

###### Travel stops and position indicator.

###### Factory lubricated and sealed requiring no additional lubrication.

##### Double Acting:

###### Nonmetallic for operation on non-lubricated air.

###### Hand-wheel over-ride independent of cylinder.

##### Spring Return:

###### Open, closed, or throttling, steel cylinder with air-line lubricators. Non-lubricated air may be used if certified by the manufacturer.

###### Modulating: Nonmetallic for operation on non-lubricated air.

###### Manual override manufacturer’s standard.

#### Diaphragm Actuator:

##### Spring return with steel or aluminum diaphragm case and spring barrel, steel spring and actuator stem, and fabric reinforced neoprene diaphragm.

##### 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 on the Drawings *[Consultant to amend as required]*. Actuating mechanism factory lubricated and sealed.

##### Diaphragm actuators sized and configured for the service indicated in the Contract Documents *[Consultant to ensure such details are in the Contract Documents]*and an air supply pressure of [242 kPa (gauge)] [     ].

#### Accessories:

##### Air Set:

###### Pressure regulator with internal relief, filter, outlet pressure gauge, and adjustable reduced pressure range as required by the valve actuator.

###### Aluminum body and hand-wheel.

###### Safety vented lockout isolation valve.

###### Gauge range 1.33 to 2 times maximum operating pressure.

##### Air Exhaust Muffler:

###### In the exhaust port of all actuator pilot solenoid valves.

###### [Consultant to provided constraints and requirements]

##### Limit Switch:

###### Single pole, double throw (SPDT) type, rated 10 amps at 120 volts ac.

###### Housed in NEMA 4 enclosure.

###### Adjustable for OPEN and CLOSED valve positions.

##### Positioner:

###### 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 shall be suitable for double acting or spring return actuator.

###### Positioner shall have zero and span adjustment and shall be field reversible for direct or reverse action.

###### Gauges for supply and output pressure and for input signal pressure.

###### Positioner for [21 105] kPa (gauge) pneumatic input signal or 4 to 20 mA dc input signal as indicated in the Contract Documents.

###### 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 shall not be required for the transducer.

###### Corrosion resistant enclosures for positioners and transducers shall be splash and moisture proof with gasketed covers.

##### Pilot Solenoid Valve:

###### 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.

###### Pilot operated diaphragm type solenoid valve with brass body and resilient seat. Valve with minimum operating pressure differential no greater than 70 kPa (gauge) and maximum operating pressure differential no less than1,035 kPa. Internal parts shall be corrosion resistant. Solenoid valve shall have Class F molded coils for operation on 120 volts, 60 Hz, ac, unless otherwise indicated in the Contract Documents. Solenoid enclosure as defined in [NEMA 250, Type 4.] [     ].

#### Open Close and Throttling Valve:

##### Double Acting Cylinders: Four-way solenoid with dual coils.

##### Spring Return Cylinders: Three-way solenoids, spring return.

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

#### Control Features: Pneumatic operators with features noted in the Pneumatic Operator Schedule.*[Consultant to insert Penumatic Operator Schedule]*

## Accessories

### Tagging: 38 mm diameter heavy brass or stainless steel tag attached with No. 16 solid brass or stainless steel jack chain for each [valve operator] [valve] [     ] inch and larger, bearing the valve tag number shown on the [Electric Operator Schedule] [Pneumatic Operator Schedule. [Valve Schedule] [Drawings].

### Limit Switch:

#### Factory installed limit switch by the actuator manufacturer.

#### [SPST, rated at 5 amps, 120 volts ac.] [     ].

### T - Handled Operating Wrench:

#### [     ] each galvanized operating wrenches, 1.22 metre long.

#### [     ] each galvanized operating keys for cross handled valves.

### Extension Bonnet for Valve Operator:

### Complete with enclosed stem, extension, support brackets, and accessories for valve and operator.

### Floor Stand and Extension Stem:

#### Non-rising, indicating type.

#### Complete with solid extension stem, coupling, hand-wheel, stem guide brackets, and yoke attachment.

#### Stem Guide: Space such that stem L/R ratio does not exceed 200.

#### Anchor Bolts: Type 304 SST.

### Floor Box and Extension Stem:

#### Plain type, for support of non-rising type stem.

#### Complete with solid extension stem, operating nut, and stem guide brackets.

#### Stem Guide: Space such that stem L/R ratio does not exceed 200.

#### Anchor Bolts: Type 304 SST.

### Chain Wheel and Guide:

#### Hand-wheel direct mount type.

#### Complete with chain.

#### Galvanized or cadmium plated.

### Cast Iron Valve Box: Designed for traffic loads, sliding type, with a minimum 6 inch ID shaft.

#### Box: Cast iron with minimum depth of 225 mm.

#### Lid: Cast iron, minimum depth of 75 mm, marked [WATER.] [SEWER.] [GAS.] [     ].

#### Extensions: [Cast iron.] [Cast iron, ABS, or PVC pipe.]

### Concrete Valve Box: Designed for traffic loads, sliding type, with minimum 200mm ID shaft.

#### Box: Concrete, minimum depth of 300 mm, cast iron ring seat.

#### Lid: Cast iron, minimum depth of 75 mm, marked [WATER.] [SEWER.] [GAS.] [     ].

#### Extensions: [Concrete.] [ABS, PVC, or cast iron pipe.]

# EXECUTION

## Installation

### Flange Ends:

#### Flanged valve bolt-holes shall straddle vertical centreline of pipe.

#### Clean flanged faces, insert gasket and bolts, and tighten nuts progressively and uniformly.

### Screwed Ends:

#### Clean threads by wire brushing or swabbing.

#### Apply joint compound.

### PVC and CPVC Valves:

#### Install using solvents approved for valve service conditions.

### Valve Orientation:

#### Install operating stem vertical when valve is installed in horizontal runs of pipe having centreline elevations 1,476 mm or less above finished floor, unless otherwise shown.

#### Install operating stem horizontal in horizontal runs of pipe having centreline elevations between 1,476 mm and 2,057 mm above the finish floor, unless shown otherwise on the Contract Drawings.

#### Orient butterfly valve shaft so that unbalanced flows or eddies are equally divided to each half of the disc, i.e., shaft is in the plane of rotation of the eddy.

#### If no plug valve seat position is shown on the Drawings, locate as follows:

##### Horizontal Flow: The flow shall produce an “un-seating” pressure, and the plug shall open into the top half of valve.

##### Vertical Flow: Install seat in the highest portion of the valve.

### 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.

### Install safety isolation valves on [compressed air.] [fuel oil.] [     ].

### Locate valve to provide accessibility for control and maintenance. Install access doors in finished walls and plaster ceilings for valve access.

### Extension Stem for Operator: Where the depth of the valve is such that its centreline is more than 984 mm below grade, furnish an operating extension stem with 50 mm operating nut to bring the operating nut to a point 152 mm below the surface of the ground and/or box cover.

### 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 the valve.

### Floor Box and Stem: Steel extension stem length shall locate operating nut in floor box.

### Chain Wheel and Guide: Install chain wheel and guide assemblies or chain lever assemblies on manually operated valves over 2,057 mm above finished floor. Where chains hang in normally traveled areas, use appropriate “L” type tie back anchors.

## Tests and Inspection

### Valve may be either tested while testing pipelines, or as a separate step.

### 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.

### Inspect air and vacuum valves as pipe is being filled to verify venting and seating is fully functional.

### Count and record the number of turns to open and close valve; account for any discrepancies with the manufacturer’s data.

### Set, verify, and record set pressures for all relief and regulating valves.

### Automatic valves shall be tested in conjunction with control system testing. Set all opening and closing speeds, limit switches, as required or recommended by the Consultant.

## Manufacturer’s Services

### The valve(s) as listed below require manufacturer’s field services:

#### [V504,] [V754,] [     ].

### Manufacturer’s Representative: Ensure that the manufacturer’s representative is present at the Site for the minimum number of person days listed below, travel time excluded:

#### [ ] Person Days for [installation assistance] [and] [inspection.]

#### [ ] Person Days for [functional] [and] [performance] testing and completion of the Manufacturer’s Certificate of Proper Installation.

### Refer to Section 01640 - Manufacturers’ Services, and Section 01810 - Equipment Testing and Facility Commissioning for additional requirements.

## Supplements

### The supplements listed below, attached following “End of Section,” form part of this Section.

#### Electric Operator Schedule

#### Pneumatic Operator Schedule

#### Valve Schedule

**END OF SECTION**

**ELECTRIC OPERATOR SCHEDULE**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Tag Number\* | Valve Type | Size ( mm) | Fluid | Maximum Operating Flow | Maximum P  (kPa) | Service | Travel Time (Seconds) | Control Features |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| Service: O/C = Open-Close, T = Throttling, M = Modulating  Control Features:  A = LOCAL-OFF-REMOTE selector switch with integral OPEN-STOP-CLOSE pushbutton control in LOCAL mode and provisions for remote OPEN-STOP-CLOSE control in REMOTE mode.  B = Operation from 120-volt, single-phase power.  C = Position feedback circuit which generates a 4 to 20 mA dc signal in proportion to valve position, capable of driving into loads up to 750 ohms at 24-volt dc.  D = Auxiliary contact which closes when the HAND-OFF-AUTO or LOCAL-OFF-REMOTE switch is in the AUTO or REMOTE position.  E = Actuator shall open valve upon loss of signal.  F = Actuator shall remain in last position upon loss of signal.  G = Three SPDT 120-volt interposing relays for remote OPEN-STOP-CLOSE control. Relays powered externally, thereby permitting valve control from greater distances.  H = Motor and control enclosure(s) NEMA 250, Type 7.  \* Equipment Tag list conforming to Tagging Standards in accordance with Design Guidelines Section 21 – Development and Maintenance of Asset Inventory and Tagging. | | | | | | | | |

**PNEUMATIC OPERATOR SCHEDULE**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Tag Number\* | Valve Type | Size ( mm) | Fluid | Maximum Operating Flow | Maximum P (kPa) | Service | Travel Time (Seconds) | Control Features |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| Service: O/C = Open-Close, T = Throttling, M = Modulating  Control Features:  A = Valve shall open upon loss of signal.  B = Valve shall remain in last position upon loss of signal.  C = Spring return.  D = Positioner with 20.7 to 103.5 kPa (gauge) pneumatic input signal.  E = Diaphragm type.  \* Equipment Tag list conforming to Tagging Standards in accordance with Design Guidelines Section 21 – Development and Maintenance of Asset Inventory and Tagging. | | | | | | | | |

**VALVE SCHEDULE**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Tag No. \* | Valve Type No. | Size (mm) | Inlet\*\*  Pressure | Outlet\* Pressure | Maximum kPa (gauge) | Flow (L/min) | Fluid |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
| \* Equipment Tag list conforming to Tagging Standards in accordance with Design Guidelines Section 21 – Development and Maintenance of Asset Inventory and Tagging.  \*Inlet Pressure = Set pressure for pressure relief valve or downstream set pressure for pressure reducing valve. | | | | | | | |