CDM Smith

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January 26, 2017

Charles Di Giacomo
Department of Environmental Protection
Division of Water Quality
Municipal Finance and Construction Element
Bureau of Construction, Payments & Administration
PO Box 420
Trenton, NJ 08625

Subject: New Jersey Environmental Infrastructure Trust (NJEIT)
Waste Activated Sludge Pumping Station Expansion Project
NJEIT Project No.: S340689-34
Passaic Valley Sewerage Commission (PVSC)
AIS Availability Waiver

Dear Mr. Di Giacomo:

This letter serves as a request on behalf of the Passaic Valley Sewerage Commission (PVSC) for an Availability Waiver of the American Iron and Steel requirements for a component of the above referenced project. Specifically, we are herein requesting permission to utilize a full port 10-inch ball valve as manufactured by Flo-Tite, Inc. for the purpose of isolation of the waste activate sludge (WAS) pumps on the suction side. The following information is included for your review and reference:

1. The referenced project is being constructed in Newark, New Jersey to provide PVSC with increased WAS pumping capacity. The project consists of installation of four (4) screw impeller centrifugal pumps, associated piping, and floor cones in the influent well.

2. Project Specifications (attached in Section 4) specified full port, flanged cast or ductile iron body ball valve with interior and exterior epoxy coating. Flanges shall be flat faced Class 125lb and valve face to face dimensions shall be equal to ANSI 16.10. The ball shall be 316 stainless steel or PFA infused cast iron. Seats and Seals shall be reinforced PTFE. The valves shall be provided with gearbox and handwheel.

3. Following our determination that the specified valve is not domestically sourced and no domestic manufacturer of 10-inch full port ball valves exists, alternatives were explored. However, due to the flow requirements, the valve could not be sized smaller than 10-

inches and due to the available lay length, the valve could not be sized larger than 10-inches. For these reasons, such alternatives have not been further pursued.

For the reasons presented above, we hereby request a waiver of the American Iron and Steel requirements for the 10-inch full port ball valve. The Flo-Tite valve has no current domestic equivalent and allows for a superior product. To our knowledge, no waiver requests for this product have previously been submitted to the United States Environmental Protection Agency (EPA).

Accordingly, should you find the above information and enclosed documentation suitable, we kindly request that your office forward this request to the appropriate party of the EPA for their review and approval.

Should you have any further questions regarding this matter, please do not hesitate to contact me at (732) 225-7000.

Sincerely,

Thomas A. Laustsen, P.E., BCEE

Associate

CDM Smith Inc.

cc: K. LaPenta (PVSC)
J. Rogers (CDM Smith)
D. Beesley (Coppola)
File (5063-99634)

NOTE: The following attachments were submitted with the waiver request and are available upon request by emailing SRF_AIS@epa.gov.

Attachment 1: Vendor Correspondence Records
Attachment 2: Waste Sludge Pump Room Modifications Plan
Attachment 3: Floating Ball Valve Manufacturer Product Sheet
Attachement 4: Project Schedule

NJEIT No.: S340689-34

Passaic Valley Sewerage Commission

Availability Waiver American Iron and Steel Provisions

Waste Activated Sludge Pumping Station Expansion Project
600 Wilson Avenue

City of Newark, Essex County
New Jersey

January 2017

CDM Smith

NEW JERSEY ENVIRONMENTAL INFRASTRUCTURE TRUST
PROJECT NO.: S340689-34
PASSAIC VALLEY SEWERAGE COMMISSION
WASTE ACTIVATED SLUDGE PUMPING STATION
EXPANSION PROJECT
AVAILABILITY WAIVER

TABLE OF CONTENTS

PASSAIC VALLEY SEWERAGE COMMISION
WASTE ACTIVATED SLUDGE PUMPING STATION
EXPANSION PROJECT
AMERICAN WATER AND STEEL PROVISIONS
AVAILABILITY WAIVER

Section 1 – Information Checklist for Waiver Request

Appendix 1: Information Checklist for Waiver Request

The purpose of this checklist is to help ensure that all appropriate and necessary information is submitted to EPA, EPA recommends that States review this checklist carefully and provide all appropriate information to EPA. This checklist is for informational purposes only and does not need to be included as part of a waiver application.

Items	X	Notes
General • Waiver request includes the following information: - Description of the foreign and domestic construction material	X	Section 2 & 5
- Unit of Measure	X	Section 2
- Quantity	X	Section 2
- Price	X	Section 2
- Time of delivery or availability	X	Section 2 & 6
- Location of the construction project	X	Section 2
- Name and address of the proposed supplier	X	Section 2
- A detailed justification for the use of foreign construction materials	X	Section 3
• Waiver request was submitted according to the instructions in the memorandum	X	Section 3
• Assistance recipient made a good faith effort to solicit bids for domestic iron and steel products, as demonstrated by language in requests for proposals, contracts, and communications with the prime contractor	X	Section 3
Cost Waiver Requests • Waiver request includes the following information: - Comparison of overall cost of project with domestic iron and steel products to overall cost of project with foreign iron and steel products		
- Relevant excerpts from the bid documents used by the contractors to complete the comparison		
- Supporting documentation indicating that the contractor made a reasonable survey of the market, such as a description of the project for identifying suppliers and a list of contacted suppliers		
Availability Waiver Requests • Waiver request includes the following supporting documentation necessary to demonstration the availability, quantity, and/or quality of the materials for which the waiver is requested: - Supplier information or pricing information from a reasonable number of domestic suppliers indicating availability/delivery date for construction materials	X	Product is noted to be unavailable.
- Documentation of the assistance recipient's efforts to find available domestic sources, such as a description of the process for identifying suppliers and a list of contacted suppliers.	X	Section 3
- Project Schedule	X	Section 7
- Relevant excerpts from project plans, specifications, and permits indicting the required quantity and quality of construction materials	X	Section 4
• Waiver request includes a statement from the prime contractor and/or supplier confirming the non-availability of the domestic construction materials for which the waiver is sought	X	Section 3
• Has the State received other waiver requests for the materials described in this waiver request, for comparable projects?		Unknown

PASSAIC VALLEY SEWERAGE COMMISION
WASTE ACTIVATED SLUDGE PUMPING STATION
EXPANSION PROJECT
AMERICAN WATER AND STEEL PROVISIONS
AVAILABILITY WAIVER

Section 2 – General Information Items

PASSAIC VALLEY SEWERAGE COMMISSION
WASTE ACTIVATED SLUDGE PUMPING STATION
EXPANSION PROJECT
CONTRACT NO. A992

AIS Waiver

Item No.	Item Description	Value
1.)	Description of the foreign and domestic construction materials	Valve construction materials are cast iron body and stainless steel ball and stem.
2.)	Unit Measure	Each
3.)	Quantity	Four (4)
4.)	Price	Approximately $4,500 Each The item for which the waiver is being requested is part of a lump sum item totally $497,890 of the overall contract amount $627,890. The actual material cost of the 4 10-in full port ball valves is approximately $18,000.00.
5.)	Time of delivery or availability	The delivery of the valves is approximately 4-6 weeks from approval.
6.)	Location of the construction project	Passaic Valley Sewerage Commission 600 Wilson Avenue Newark, NJ 07105
7.)	Name and address of the proposed supplier	The valve manufacturer Flo-Tite is located at 305 East 21st St., Lumberton, NC. Valve supplier to contractor is Raritan Supply, located at 301 Meadow Rd., Edison, NJ.
8.)	A detailed justification for the use of foreign construction materials	The flow requirements of the system specifically requires the 10" ball valves to be full port. Attempts were made to locate a valve meeting the specification and AIS requirements, however such a valve was not found. All of the valves researched that meet the specification are sourced off shore using foreign materials. The Flo-Tite valve meets the specification but does not comply with the domestic requirements.
9.)	Assistance recipient made a good faith effort to solicit bids for domestic iron and steel products, as demonstrated by language in requests for proposals, contracts, and communication with the prime contractor.	Attached is correspondence records between the prime contractor and domestic suppliers regarding the availability of the valves.
10.)	Project Schedule	The Project Schedule shows two project paths where the valves are needed. The first two are needed to replace pumps 1 and 2 and the second two are needed to replace pumps 3 and 4. The ball valves are the earliest stage of the critical path for the replacement of each pump, thus imperative that they be released and delivered in a timely manner.

PASSAIC VALLEY SEWERAGE COMMISION
WASTE ACTIVATED SLUDGE PUMPING STATION
EXPANSION PROJECT
AMERICAN WATER AND STEEL PROVISIONS
AVAILABILITY WAIVER

Section 4 – Project Specifications Section 015100 – Valves
Contract Drawing Sheet M-6 – Waste Sludge Pump Room, Modifications Plan

SECTION 15100

VALVES

PART 1: GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and install complete and ready for operation and test all non-buried valves as shown on the Drawings and as specified herein.

B. Provide services to upgrade existing electric actuators, mount on new valves and set operating stops, as indicated on the Drawings and specified herein.

C. The equipment shall include, but not be limited to, the following. However not all items specified herein may be included in this project.

1. General Requirements
2. Valve Actuators – Manual
3. Valve Actuators – Powered
4. Gate Valves
5. Plug Valves
6. Check Valves
7. Ball Valves
8. Thermoplastic Valves
9. Needle Valves
10. Pressure Regulating Valves
11. Solenoid Valves
12. Corporation Stops
13. Air Release and Vacuum Relief Valves

1.02 RELATED WORK

A. Valve tags are included in Section Section 01340.

B. Buried valves and appurtenances are included in Division 2.

C. Piping and disinfection for potable water systems is included in the respective Sections of Divisions 2 and 5.

D. Shop and Finish painting is included in Sections 09901 and 09902.

E. Instrumentation, not specified herein, is included in Division 13.

F. Valves on all HVAC and plumbing systems are included in their respective sections of Division 15.

G. Piping Specialties are included in Section 15120.

H. Electrical work is included in Division 16.

I. Certain items similar to those specified in this Section may be specified to be furnished and installed with individual equipment or systems. In case of a conflict, those individual equipment or system requirements shall govern.

J. Electric valve operators of all types, rate of flow controllers (including modulating valves and operators) and other types of valves which are part of the automated instrumentation (such as some solenoid valves) if not included herein are included in Division 13. Valve operators shall, however, be mounted at the factory on the valves as specified herein, as part of the work of this Section.

1.03 SUBMITTALS

A. Submit to the Engineer, in accordance with Section 01300, materials required to establish compliance with this Section. The first submittal shall be the valve schedule described in Paragraph 1.09. Approval of the valve schedule submittal is required prior to Contractor submitting any of the equipment in this specification. Subsequent Equipment Submittals shall include at least the following:

1. Valve tag number.

2. The manufacturer and supplier.

3. The address at which equipment will be fabricated or assembled.

4. Drawings showing assembly details, materials of construction and dimensions.

5. Descriptive literature, bulletins and/or catalogs of the equipment.

6. The total weight of each item.

7. A complete bill of materials.

8. Additional submittal data, where noted with individual pieces of equipment.

9. Individual electrical/pneumatic/hydraulic control schematics and wiring diagrams for each valve operator with all external interfaces, identified exactly as detailed on the Electrical and Instrumentation Drawings. Standard catalogue cut sheets that show typical wiring diagrams only are not acceptable. Valve actuators shall be coordinated with electrical requirements shown on the Drawings and valves as specified herein.

B. Test Reports

1. Provide certified hydrostatic test data, per manufacturer's standard procedure or MSS-SP-61 for all valves.

C. Certificates

1. For each valve specified to be manufactured, tested and/or installed in accordance with AWWA and other standards, submit an affidavit of compliance with the appropriate standards, including certified results of required tests and certification of proper installation.

D. Manufacturer's Installation and Application Data

E. Operating and Maintenance Data

1. Operating and maintenance instructions shall be furnished to the Engineer as provided in Section 01730. The instructions shall be prepared specifically for this installation and shall include all required cuts, drawings, equipment lists, descriptions and other information required to instruct operating and maintenance personnel unfamiliar with such equipment.

1.04 REFERENCE STANDARDS

A. ASTM International

1. ASTM A48 - Standard Specification for Gray Iron Castings.

2. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.

3. ASTM A240 - Standard Specification for Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels.

4. ASTM A276 - Standard Specification for Stainless Steel Bars and Shapes.

5. ASTM A436 - Standard Specification for Austenitic Gray Iron Castings.

6. ASTM A536 - Standard Specification for Ductile Iron Castings.

7. ASTM B30 - Standard Specification for Copper-Base Alloys in Ingot Form.

8. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings

B. American Water Works Association (AWWA)

1. AWWA C111 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

2. AWWA C500 - Metal-Seated Gate Valves Supply Service

3. AWWA C507 - Ball Valves, 6-in through 48-in (150mm through 1200mm)

4. AWWA C508 - Swing-Check Valves for Waterworks Service, 2-in (50mm through 24-in (600mm) NPS

5. AWWA C509 - Resilient-Seated Gate Valves for Water Supply Service

6. AWWA C511 - Reduced-Pressure Principle Backflow-Prevention Assembly

7. AWWA C540 - Power-Actuating Devices for Valves and Sluice Gates

8. AWWA C541 – Hydraulic and Pneumatic Cylinder and Vane Type Actuators for Valves and Slide Gates

9. AWWA C550 - Protective Epoxy Interior Coatings for Valves and Hydrants

10. AWWA C800 - Underground Service Line Valves and Fittings

C. American National Standards Institute (ANSI)

1. ANSI B1.20.1 - Specifications, Dimensions, Gauging for Taper and Straight Pipe Threads (except dry seals).

2. ANSI B16.1/16.42/16.5 - Cast Iron/Ductile Iron/Steel and Stainless Steel Pipe Flanges and Flanged Fittings

3. ANSI B16.10 - Face-to-Face and End-to-End Dimensions of Valves

D. American Iron and Steel Institute (AISI)

E. Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS)

1. MSS-SP-61 - Pressure Testing of Steel Valves.

2. MSS-SP-70 - Cast Iron Gate Valves, Flanged and Threaded Ends.

3. MSS-SP-71 - Cast Iron Swing Check Valves, Flanges and Threaded Ends.

4. MSS-SP-72 - Ball Valves with Flanged or Butt-Welding Ends for General Services.

5. MSS-SP-78 - Cast Iron Plug Valves, Flanged and Threaded Ends.

6. MSS-SP-80 - Bronze Gate, Globe, Angle and Check Valves.

7. MSS-SP-82 - Valve Pressure Testing Methods

8. MSS-SP-98 - Protective Coatings for the Interior of Valves, Hydrants and Fittings.

F. National Electrical Manufacturers Association (NEMA)

G. Underwriters Laboratories (UL)

H. Factory Mutual (FM)

I. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 QUALITY ASSURANCE

A. Qualifications

1. Valves and actuation systems shall be products of well established firms who are fully experienced, minimum 10 years, reputable and qualified in the manufacture of the particular equipment to be furnished.

2. The valves shall be mated to actuators at manufacturers or integrators facility. Actuated valves shall be fully tested and certified ready for installation prior to shipment to the job site. In no case shall actuators be mounted to the valves in the field.

3. All valves of the same type shall be the product of one manufacturer.

4. Valve actuators in each below category shall be the product of one manufacturer, Contractor shall coordinate this requirement with actuated valves included in the scope of vender furnished equipment specified in Division 11, 13, 14 and 15.
   a. 120 volt, single phase for valves 3 inch and below
   b. 480 volt, three phase
   c. Pneumatic
   d. Hydraulic

B. Certifications

1. The manufacturers shall furnish an affidavit of compliance with Standards referred to herein as specified in Paragraph 1.03C above. Refer to PART 3 for testing required for certain items in addition to that required by referenced standards.

C. Provide the services of a qualified and factory-trained service representative of the manufacturer to provide operational and maintenance instruction, for a 1 day, 8 hour period for each type of the following equipment:

1. 480 volt electric actuators.

2. Pneumatic actuators

3. Hydraulic cylinder actuators

4. Pressure regulating valves.

5. Surge relief valves.

6. Pinch valves.

D. Inspection of the units may also be made by the Engineer or other representative of the Owner after delivery. The equipment shall be subject to rejection at any time due to failure to meet any of the specified requirements, even though submittal data may have been accepted previously.

Equipment rejected after delivery shall be marked for identification and shall be removed from the job site at once.

1.06 SYSTEM DESCRIPTION

A. All of the equipment and materials specified herein are intended to be standard for use in controlling the flow of water, wastewater, sludge, air, and chemicals as noted on the Drawings.

B. Valves, appurtenances and miscellaneous items shall be installed as shown on the Drawings and as specified, so as to form complete workable systems.

C. Unless otherwise noted all electrically powered valve operators shall have:

1. Valves larger than 3-in: electric operators 460 Volt, 3 Phase, 60 Hz.

2. Valves 3-inch and under: electric operators, 120 Volt, 1 Phase, 60Hz.

3. Solenoid valves: 120 volt, single phase, 60 Hz, NEMA 4 enclosure, continuous duty Class F coils and manual operator. Solenoid valves for seal water systems shall be "fail open" design; others shall be "fail closed" unless otherwise noted on the Drawings or in the Instrumentation specifications.

1.07 DELIVERY, STORAGE AND HANDLING

A. Reference is made to Section 01600 for additional information.

B. Packing and Shipping

1. Care shall be taken in loading, transporting and unloading to prevent injury to the valves, appurtenances, or coatings. Equipment shall not be dropped. All valves and appurtenances shall be examined before installation and no piece shall be installed which is found to be defective. Any damage to the coatings shall be repaired as acceptable to the Engineer.

2. Prior to shipping, the ends of all valves shall be acceptably covered to prevent entry of foreign material. Covers shall remain in place until after installation and connecting piping is completed.
   a. All valves 3-in and larger shall be shipped and stored on site until time of use with wood or plywood covers on each valve end.
   b. Valves smaller than 3-in shall be shipped and stored as above except that heavy cardboard covers may be used on the openings.
   c. Rising stems and exposed stem valves shall be coated with a protective oil film which shall be maintained until the valve is installed and put into use.
   d. Any corrosion in evidence at the time of acceptance by the Owner shall be removed, or the valve shall be removed and replaced.
   e. Actuated valve assemblies shall be blocked and secured to prevent any strain on the mounting arrangement during transit and storage. All electrical/pneumatic/hydraulic components shall be protected from weather and moisture in any form.

C. Storage and Protection

1. Special care shall be taken to prevent plastic and similar brittle items from being directly exposed to the sun, or exposed to extremes in temperature, to prevent deformation. See the individual piping sections and manufacturer's information for further requirements.

1.08 MAINTENANCE

A. Special tools and the manufacturer's standard spare parts, if required for normal operation and maintenance, shall be supplied with the equipment in accordance with Section 01730 and where noted, as specified herein. Tools shall be packaged in a steel case, clearly and indelibly marked on the exterior to indicate equipment for which tools are intended.

B. Provide one Operations and Maintenance manual for each type of valve and operator supplied under this specification in accordance with Section 01730.

C. Included within the Operations and Maintenance manuals, provide a list of all spare and replacement parts with individual prices and location where they are available.

1.09 VALVE DESIGNATIONS AND SCHEDULE

A. Valve locations and basic types are shown on the Drawings. The specific valve type and trim required is identified by the valve call outs. The valve call outs include an alpha-numeric Tag that indicates the required valve type/trim for that location. The products specified in Section 2 below each have a Tag identifier. Powered actuator type is identified by symbology on the P&IDs. If a valve Tag is not included on the Drawing call outs, Contractor shall submit an RFI requesting valve identification.

B. The Contractor shall refer to the P&IDs and Mechanical Drawings and prepare a Valve Schedule for each process valve in the Project. Contractor’s first submittal under this Section shall be the Valve Schedule, which shall include a unique valve Number as labeled on the P&IDs. Submit with the Valve List a copy of the Contract Drawing P&IDs indicating each unique valve Number next to the valve symbol. This valve schedule shall NOT include the valves furnished in Plumbing and HVAC sections of Division 15.

C. The valve schedule shall include: valve Number; valve Tag; valve size; end connections, operator type and reference Drawing number(s). The valve tag convention shall be as required by the Owners convention, coordinated during the Valve Schedule submittal process. Where electric, hydraulic or pneumatic actuators are supplied their type shall be so noted with an E, H or P. Modulating duty actuators shall be noted with an M following the actuator type notation.

D. The Contractor shall include the Valve Number and Tag with each valve shop drawing submittal.

E. An excerpt of an EXAMPLE schedule is as follows:

Number	Tag	Size	Ends	Operator	Drawing Number
1000	BV1	2-in	Flanged	Lever	I-4, M-12
1002	PV2	8-in	Lugged	Gear/Handwheel	I-5, M-15
1005PV1	6-in	Flanged	EM	I-7, M-16	

PART 2: PRODUCTS

2.01 MATERIALS AND EQUIPMENT - GENERAL

A. Reference is made to Division 1 for additional requirements, including nameplates, provisions for temporary pressure gauges, protection against electrolysis and anchor bolts.

B. The use of a manufacturer's name and/or model or catalog number is for the purpose of establishing the standard of quality and general configuration desired.

C. Valves shall be of the size shown on the Drawings or as noted.

D. All products shall be new and unused. All valves of the same type shall be identical and from one manufacturer.

E. Valves and appurtenances shall have the name of the maker, nominal size, flow directional arrows, working pressure for which they are designed and standard referenced, cast in raised letters or via riveted stainless steel nameplate upon some appropriate part of the body.

F. Unless otherwise noted, items shall have a minimum working pressure of 150 psi or be of the same working pressure as the pipe they connect to, whichever is higher and suitable for the pressures noted where they are installed.

G. Provide all special adaptors as required to ensure compatibility between valves, appurtenances and adjacent pipe.

H. No alternative materials will be considered for approval unless complete documentation is provided regarding their satisfactory long-term use in similar conditions; in addition, the consideration of any substitution will be considered only if the superiority of the proposed materials is the intent of the substitution, and only if sufficient evidence is provided to document that superiority.

I. Manually actuated, valves shall be provided with an operating wheel, handle or AWWA 2-in nut.

J. Unless otherwise noted, operation for all valves shall be CCW open.

2.02 VALVE ACTUATORS - MANUAL

A. Nut actuated valves shall be provided where indicated and where installed in valve boxes or accessed through floor penetrations.

1. Provide one tee handle wrench for every four nut actuated valves. Tee handle extension length shall be determined based on the nut height as shown on the Drawings, and coordinated during the submittal process. Tee handle wrench length shall provide tee handle approximately 3 feet above floor of vantage point. Provide one nut wrench for each nut differing 1.5 feet or more from vantage point description.

B. Geared actuators shall be suitable for all weather service, with mechanical shaft seals, shall be permanently greased, or shall have provisions for greasing. Actuators for submerged duty shall be so rated, with certification by manufacturer for submerged service.

C. The valve manufacturer shall supply, mount and test all actuators on valves at the factory. The valves and their individual actuators shall be shipped as a unit.

D. Except as otherwise shown on the Drawings or specified herein, all valves 3-in diameter or larger, with the valve hand wheel center line located 7-ft or more above the operating floor, shall be provided with chain wheel operators complete with chain guides and hot dipped galvanized steel chain, which loop within 4-ft of the operating floor. These requirements shall supersede positioning lever actuator requirements of manual butterfly valves 6 inch and smaller.

E. All actuators shall be capable of moving the valve from the full open to full close position and in reverse and holding the valve at any position part way between full open or closed.

F. Each operating device shall have cast on it the word "OPEN" and an arrow indicating the direction of operation.

G. Floor boxes for operating nuts recessed in concrete shall be standard cast iron type, cast-in-place, with fastening top, and 316 stainless steel hardware.

H. Stem guides shall be of the adjustable wall bracket type, bronze bushed, with maximum spacing of 10-ft as manufactured by Clow; Rodney Hunt or equal. Extended operating nuts and/or stems shall have universal joints and pin couplings, if longer than 10-ft and a rating of at least five times the maximum operating torque. Stem adaptors shall be provided.

I. Where required by the installation, or as specified, provide the following: extended stem; floor stand and handwheel; position indicator and etched or cast arrow to show direction of rotation to open the valve; resilient, moisture-resistant seal around stem penetration of slab.

J. Gear Actuators

1. Unless otherwise noted, gear actuators shall be provided for the following: plug and ball valves larger than 3-in diameter; butterfly valves larger than 6 inch diameter; where specified and/or indicated on the Drawings; where manual operator effort is greater than 40 lbs rim pull.

2. Actuators shall be capable of being removed from the valve without dismantling the valve or removing the valve from the line.

3. Gear actuators for quarter turn valves shall be of the worm or helical worm gear type with output shaft perpendicular to valve shaft, having a removable hand wheel mounted on the output shaft. Where shown on the Drawings, a 2 inch cast iron operating nut shall be provided. Actuators shall conform to AWWA C504 except where more stringent requirements are provided hereinafter. Worm shall be hardened steel (get ASTM), driven gear shall be bronze (get ASTM). Surfaces shall be . Bearings shall be permanently lubricated, with bronze bearing bushings provided to take all thrusts and mechanical shaft seals to contain lubricants. Housings shall be sealed to exclude moisture and dirt, allow the reduction mechanisms to operate in lubricant and be constructed of cast iron, ASTM A126, Grade B, or of ductile iron, ASTM A536. Gear housing bodies for thermoplastic valves

may be cast aluminum or fabricated steel to reduce weight. Gear actuators shall indicate valve position and have adjustable stops.

4. Where indicated on the Drawings, gear actuators for butterfly valves shall be of the travelling nut type with output shaft perpendicular to valve shaft, having a removable hand wheel mounted on the output shaft. Unless noted they shall conform to AWWA C504. Stem shaft shall be machine cut alloy steel, nut and cross head shall be bronze, lever shall be ductile iron. Nut Actuators for valves 24-in and smaller shall be slotted lever design, actuators for valves greater than 24 inch shall be link and lever design. Mechanism shall be lubricated with water resistant extreme pressure NLGI No. 2 grease. Bevel gear reduction box shall be mounted on the actuator when required to meet specified manual operating effort requirements Gear actuators shall have mechanical, external indication of valve position and have adjustable threaded stops secured to the stem with spring pins. Stop shall be capable of withstanding 450-fts-lb of input torque. Stop adjustment requiring shims are not acceptable.

5. Manual Input torque to produce required valve operating torque for worm and travelling nut gear operators shall not exceed 80 ft-lbs. In addition, hand wheel rim pull shall not exceed 20 lbs for valve sizes up to 12 inches, 40 lbs for valve size between 14 and 20 inches, 60 lbs for valve size 24 and greater. Minimum hand wheel size shall be 8 inches for up to 12 inch valve size, 12 inches for up to 16 inch valve size, 18 inches for up to 20 inch size.

6. Gear actuators for multi turn valves shall be of the bevel or spiral bevel type with output shaft perpendicular to valve shaft, having a removable hand wheel mounted on the output shaft. Gearing shall be machine cut steel designed for smooth operation. Bearings shall be permanently grease lubricated, with dual anti-friction ball bearings on the output shaft and mechanical shaft seals to contain lubricants. The output flange of the primary gear reducer shall be designed to meet an appropriate MSS or ISO standard to allow mounting to the secondary gear reducer. The ring gear shall ride on ball bearings. The stem nut shall be bronze alloy, shouldered, and ride on needle bearings. Housing components shall be o-ring sealed to exclude moisture and dirt, constructed of cast iron, ASTM A126, Grade B, or of ductile iron, ASTM A536. Gear housing bodies for thermoplastic valves may be cast aluminum or fabricated steel to reduce weight. Manual operator input effort to the hand wheel shall be a maximum of 30 lbs for operating the valve from full open to full close, under any conditions. Maximum hand wheel size shall be 24-in diameter.

K. Additional valve actuator requirements are included with the individual valve types and as noted in Paragraph 1.02 above.

L. All position indication and direction of opening arrows shall be embossed, stamped, engraved, etched or raised castings. Decals or painted indications shall not be allowed.

M. Unless otherwise noted, all valves larger than 3-in nominal diameter shall be provided with position indicators at the point of operation.

2.03 VALVE ACTUATORS - POWERED

A. Modification of Existing 480 Volt Electric Actuators

1. The existing Limitorque MX 10 actuators noted on the Drawings shall be removed from existing valves and installed on new valves furnished under this Project. The actuator data is as follows:
   a. Model: MX 10-6,
   b. Order no: 130985-002 SERIES A
   c. S/N L990432 SHC 632 (unit no 3)

2. Contractor shall furnish the services of a local representative of the actuator manufacturer-Flowserve to perform the work specified herein.

3. For each actuator, a new analog position transmitter shall be furnished and installed.
   a. Type: Non-contacting position transmitter
   b. Accuracy = 99% of full scale (for Drive Sleeve Turns > 50)
   c. Non-Linearity = ± 1% of full scale
   d. Impedance = 0-600 ohms (4-20mA signal)
   e. Minimum External Load = 1000 ohms (0-10VDC signal)
   f. Configurable to allow minimum signal to represent fully open or fully closed.
   g. Manufacturer(s) = Flowserve Limitorque Analog Position Transmitter (APT)

4. Each actuator shall be mounted on the new valves, adjusted by the certified representative and stroked 5 times to ascertain the stops are properly set.

5. The position transmitter output shall be set and checked for output signal, initial setpoint shall be signal output at 90% of closure. Provide services to adjust this setpoint in the field during start up of the pumping systems.

6. Approved vendors are Quality Controls Inc., Warwick NJ and Raritan Valve Automation, Edison, NJ.

B. General

1. Electric actuators for ¼ turn valves three inches and under, which do not have submergence requirements, and which exhibit a maximum torque specified below shall be operated on 120 volt single phase power as specified below. All other actuators shall be operated on 480 volt power.

2. The actuators shall conform to AWWA Standard C540, insofar as applicable and as herein specified. Actuators shall be O-ring sealed, watertight to standard NEMA 4X/6, submersion to 6 feet for 30 minutes. Actuators installed in vaults below grade and elsewhere subject to submergence shall be watertight to standard NEMA 6P/IP68, 15 ft for 72 hours minimum. Actuators installed in hazardous locations as noted on the Electrical Drawings and/or area classification sheets of the Architectural Drawings shall be FM certified explosion proof for Class 1 Division 1 & 2, Groups C & D and also meet the standard NEMA 4X/6 rating.

3. Valve service/operation shall be as indicated on the P&IDs and as specified in the Process Control Strategies in Section 13305.

4. 480 Volt powered actuators shall be Rotork IQ/IQM; Limitorque MX; EIM TEK 2000; AUMA SA/SAR. Actuators shall be configured as required to provide for part turn or

multi-turn and be coupled with gearboxes as required to obtain the speed and operating torque as required for the valve or gate it controls.

5. Modulating actuators shall contain proportional control unit and be capable of 1200 starts per hour, open-closed valve actuators shall not require a proportional control unit, and be capable of 60 starts per hour.

6. Where shown on the Instrumentation Drawings, actuators shall have a digital control module, to allow valves or gates to be positioned remotely via a 2-wire non-proprietary field bus protocol. The digital control module shall be equipped with serial communication ports to allow actuation to be linked by a two wire local area network utilizing Modbus function code (report by exception) and arranged in a self-healing ring configuration, with multi-drop taps to each actuator.

C. 120 Volt Single Phase Reversing, Non Spring Return Electric Actuators for ¼ Turn Valves, 100 to 1000 in-lb Torque Range

1. Valve actuators shall be sized by the valve supplier meeting the requirements of AWWA C540. Actuators shall be mounted on the valves in the valve suppliers facility, and factory tested.

2. Actuators shall operate on 120 volt, 60 hz single phase, power supply. Enclosure rating shall be NEMA 4X, constructed of cast aluminum or steel alloy, powder coated or fusion bonded epoxy finish.

3. Power train shall be self locking planetary epicyclical gear design, consisting of hardened steel and or hardened bronze alloy gears with bronze bearings. Housing penetrations shall be sealed with mechanical seals. Housing shall be equipped with space heaters. Valve mounting system shall be ISO 5211.

4. Actuator shall be designed for open/close/jog reversing service. Proportional/modulating service shall be provided where required in the equipment specifications or Instrumentation Drawings. Actuators shall have visual mechanical indication of position. Manual override shall be direct worm drive with minimum 5 inch diameter hand wheel. Hand wheel size shall be provided such that a maximum 40 lb rim pull is required.

5. Motors shall be designed specifically for valve actuation service, with Class F insulation, with split phase capacitor protection. Duty cycle shall not be less than 40% at 100 deg F. for open/close duty, and 100% for modulating duty. 90 degree travel time shall vary from 10 to 20 seconds depending on actuator size. Actuators shall have SPDT contacts for remote valve position indication.

6. Actuators shall be P Series as manufactured by Promation Engineering, Brooksville, FL, or equal.

D. 480 Volt Powered Actuators for Part Turn or Multi-Turn Valve Operation

1. Operation
   a. Capabilities shall be provided to position the valve (or gate) locally via the Local/Off/Remote selector switch and Open/Stop/Close push buttons.

b. For on/off service, when in remote, the actuator shall accept one remote signal to open the valve or gate and a second remote signal to close the valve or gate.
c. For modulating service, when in remote the actuator shall accept a 4-20mADC position control signal, and shall position the valve 0-100% of travel in proportion to the control signal.
d. Unless stated otherwise in the valve specifications, the actuator and gearing size shall be designed to operate the valve at a disc speed of 1 foot travel per minute of operation. For quarter turn valves, valves shall rotate from stop to stop in 30 seconds per foot of throat diameter.

2. Functional
   a. The motor operated valve controller shall include the motor, operator unit gearing, limit switch gearing, limit switches, control power transformer, position transmitter (when required), torque switches, bored and key-wayed drive sleeve for non-rising stem valves, declutch lever and auxiliary handwheel as a self-contained unit. Valve contacts shall be capable of handling the current equivalent of a NEMA 1 size starter.
   b. Reversing starters shall be integral with the actuator, and shall be solid-state starters for modulating service. Electro-mechanical reversing starters shall be acceptable for open-close service and shall be mechanically and electrically interlocked.
   c. Limit switches and gearing shall be an integral part of the valve control. The limit switch gearing shall be made of bronze or stainless steel and shall be fully lubricated, intermittent type and totally enclosed to prevent dirt and foreign matter from entering the gear train. Limit switches shall be of the adjustable type capable of being adjusted to trip at any point between fully opened valve and fully closed valve. Limit and torque switches shall be provided for stopping valve in both directions. Mid-travel switches shall be provided as required. Set position shall not be lost if over travel occurs in either manual or electric modes of operation.
   d. The valve position transmitter shall be a gear actuated, two-wire device, producing 4-20 mADC signal proportional to 0-100% of valve travel. The transmitter shall be provided with easily accessible zero and span adjustment potentiometers. The DC power supply shall be provided integral with the operator and powered from the 110 volt AC internal transformer. The positioner board shall provide repeatable accuracy to 0.25% of span. There shall be separate trim pots on the positioner board for zero, span and dead band adjustment.
   e. The speed of the actuator shall be the responsibility of the system supplier with regards to hydraulic requirements and response compatibility with other components within the control loop. Each valve controller shall be provided with a minimum of two limit switch functions, one for opening and one for closing. Each limit switch will have two normally open and two normally closed contacts. Gear limit switches must be geared to driving mechanism and in step at all times whether in motor or manual operation. Provision shall be made for two extra sets of limit switches as described above, each to have two normally open and two normally closed contacts. Each valve controller shall be equipped with a double torque switch. The torque switch shall be adjustable and will be responsive to load encountered in either direction of travel. The limit and torque switch contacts shall be silver inlay type.
   f. Each actuator shall include monitor relays to remotely indicate fault signal for indication of power failure, phase failure, thermal switch tripped, torque switch tripped between travel stops and Local-Off-Remote selector switch position.

3. Physical

a. The operator shall be equipped with open-stop-close push-buttons, a local-off-remote selector switch and indicating lights all mounted on the operator. Where operator will not be situated between 2-ft-0-in and 7-ft-0-in above the operator platform, and where shown on the Drawings, provide a separate remote valve operating station.
b. The motor shall operate on 460 volt, 60 hertz, 3 phase power and shall be sized by the actuator manufacturer to provide the required output torque for the service intended. The motor shall have Class F insulation, with a duty rating of at least 15 minutes at 40 degrees C ambient temperature. The motor shall be specifically designed and built by the actuator manufacturer for electric actuator service. Commercially available motors shall not be acceptable. The actuator shall include a device to ensure that the motor runs with the correct rotation for the required direction of valve travel regardless of the connection sequence of the power supply.
c. Operators utilizing multiple reduction power gearing shall consist of spur, helical, or bevel gearing and worm of hardened alloy steel, and the worm gear shall be alloy bronze. Operators utilizing single-stage reduction shall be single-stage worm gear totally enclosed in a fully lubricated gearcase, with filling and drain plugs. Non-metallic, aluminum, or cast gearing shall not be allowed. The output shaft shall incorporate thrust bearings of the ball or roller type at the base of the actuator.
d. An operating wheel shall be provided for manual and/or emergency operation, engaged when the motor is declutched by a lever or similar means, the drive being restored to power automatically by starting the motor. The operating wheel drive must be mechanically independent of the motor drive, and any gearing shall be such as to permit emergency manual operation, using a 40 pound force in a reasonable time. Clockwise operation of the handwheel shall give closing movement of the valve unless otherwise stated.
e. Each actuator shall be supplied with a start-up kit including installation instructions, wiring diagrams, and spare cover screws and seals to provide for losses during commissioning.
f. Continuous mechanical dial indication of valve position shall be provided. The mechanical dial position indicator shall be in step with the actuator at all times in both the hand wheel and motor operation. For modulating applications, the mechanical dial position indicator shall include graduations of 0-100 percent scale.

4. Wiring and Terminals
a. Internal wiring shall be of tropical grade PVC insulated stranded cable of 5 amp minimum rating for control circuits and of appropriate size for the motor 3 phase power. Each wire shall be clearly identified at each end.
b. The terminals shall be of the stud type embedded in a terminal block of high tracking-resistance compound. The 3-phase power terminals shall be shrouded from the control terminals by means of an insulating cover.
c. The terminal compartment shall be separated from the inner electrical components of the actuator by means of a watertight seal. The terminal compartment of the actuator shall be provided with three threaded cable entries.
d. Each actuator shall be provided with a commissioning kit consisting of a wiring diagram and installation and operation manual. A separate wiring diagram shall be provided inside the terminal cover. No special tools, devices or parts shall be required for commissioning.
e. Actuators shall have separately sealed motor and control compartments. All operators shall have space heaters in their limit switch, motor, and control compartments.

5. Remote Control Stations

a. Where shown on the Drawings, or where specified in the Equipment Specifications, valve actuators shall be furnished with control stations suitable for mounting remotely from, but, in the vicinity of the actuator. Remote mount control station shall include a Local - Off - Remote selector switch, Open - Stop - Close pushbuttons and Open - Close indicating lights. Control station operators shall be heavy duty devices mounted in a cast iron, cast aluminum, or stainless steel NEMA 4X enclosure suitable for wall mounting. Wire gage and device quality shall meet or exceed the requirements of Division 16. The Local - Off - Remote selector switch shall have auxiliary contacts for remote indication of switch position. The Local - Off - Remote selector switch shall have provisions for padlocking in the "Off" position. Additional functionality and/or devices to those specified above are detailed on the Instrumentation P&IDs and/or Electrical Control Schematic drawings. Refer to Drawings for confirmation of the scope of the Remote Control Stations.

6. Performance Test
   a. Each actuator must be shop performance tested, and individual test certificates shall be supplied without additional charge to the Owner. Test certificates shall be submitted prior to shipment of valve actuators. The test equipment shall simulate a typical valve load, and the following parameters shall be recorded:
      1) No load current
      2) Current at maximum torque setting
      3) Stall current
      4) Torque at maximum torque setting
      5) Stall torque
      6) Test voltage and frequency
      7) Flash test voltage
      8) Actuator output speed

2.04 GATE VALVES- TAG TYPE NOTED BELOW

A. General Requirements

1. Unless otherwise specified below, these requirements shall apply to all gate valves.

2. Gate valves shall meet the requirements of AWWA C500, AWWA C509 and AWWA C515 as applicable to the type of valve specified.

3. Submerged valves shall be furnished with mechanical joint ends and 316 stainless steel hardware; non-rising stem design. Flanged ends shall be provided if so indicated on the Drawings. Non-rising stem valves shall utilize a minimum of two O-ring stem seals. Mechanical joint bolting shall be 316 stainless steel with silicone bronze nuts.

4. Exposed valves shall be furnished with ANSI B16.1, B16.42 or B16.5 Class 125/150 flanged ends as applicable to specified body material. Valve dimensions shall be per ANSI B16.10. Exposed valves shall be bolted bonnet, outside screw and yoke, unless otherwise noted on the Drawings. Flange, bonnet and packing gland bolts shall be Type 316 stainless steel. Where bolts utilize nuts (bolts not threaded into casting), nuts shall be silicone bronze. Where bolting is threaded into stainless steel castings, bolting shall be Nitronic 50.

5. Rising stem valves shall be sealed with adjustable and replaceable packing; valve design must permit packing replacement under operating system pressures with only moderate leakage.

6. Unless otherwise specified, valves shall be rated at or above for the following working water pressures:

Valve Size	Pressure (psig)
3-in to 12-in	250
14-in to 30-in	150
36-in and greater	as specified

   a. All valve bodies shall be hydrostatically tested to at least twice the rated working water pressure. In addition, valves shall be seat-tested, bi-directional at the rated working pressure, with seat leakage not to exceed one fluid ounce per inch of valve diameter per hour. Provide certificates of testing.

7. Flanged valves to have face-to-face dimensions per ANSI B16.10 and flanges per ANSI B16.1.

8. Exposed valves 18-in and larger shall have valve by-pass, by-pass valves shall be of same disc type as main valve and shall meet these specifications.

9. Exposed valves 16-in and greater indicated for horizontal stem installation shall be furnished with rollers, tracks and scrapers and enclosed bevel gear grease case.

10. Provide geared operator and chain wheel, chain and chain guides for valves with handwheel centerline more than 7-ft above operating level.

11. All valves shall be marked per AWWA Standards, including name of manufacturer, valve size and working pressure and year of manufacture.

12. Unless otherwise indicated, valves 12-in and smaller shall be capable of installation in the vertical or horizontal position, and sealing in both directions at the rated pressure.

B. Valve Applications

1. Valves for Potable Water Service:
   a. Double disc design manufactured by Kennedy/ M&H/ Clow Valve.
   b. Double revolving disc manufactured by American R/D Valve; Anchor Darling.
   c. Solid wedge-resilient seated design as manufactured by Mueller Co; J&S Valve; M&H/Clow Valve; American Flow Control; American R/D Valve.

2. Valves for Wastewater Service:
   a. Solid wedge metal seated design manufactured by M&H Valve; J&S Valve, American R/D Valve; Stockham Valve, or Walworth.
   b. Solid wedge-resilient seated design as manufactured by Mueller Co; J&S Valve; M&H/Clow Valve; American Flow Control; American R/D Valve.

3. Valves for Saline Water Service:

a. Solid wedge metal seated design as manufactured by Shipham Valve, Sugarland TX; Xanik valve,

C. Valve Requirements

1. Double Disc: Tag Type GV1
   a. Conform to AWWA C500.
   b. Wedging surfaces shall be bronze, Monel or stainless steel.

2. Double Revolving Disc: Tag Type GV2
   a. Conform to applicable provisions of AWWA C500.
   b. Wedging surfaces shall be Monel or hardened stainless steel.
   c. Discs fully free to rotate, guided in travel by cast surfaces.
   d. Disc rotation shall produce a self-cleaning action during opening or closing.
   e. Wedging forces applied only when discs are in seating position.

3. Solid Wedge Metal Seat: Tag Type GV3
   a. Conform to AWWA C500
   b. All-metal valves shall be manufactured of ASTM A126 Cast Iron, Class B. Wedge seating surfaces and body seat rings shall be cast from B62 bronze.
   c. Shall be coated internally and externally with an asphaltic varnish, per AWWA C500.
   d. Body shall have tongue and grooved guides for wedges.
   e. Rollers, tracks and scrapers shall be provided for valves 16-inhes and larger, constructed of 316 stainless steel.

4. Solid Wedge Resilient Seated- Water and Wastewater Service: Tag Type GV4
   a. Resilient seated valves shall be manufactured of ASTM A536 ductile iron, vulcanized rubber disc per AWWA C509, manganese bronze or Type 316 stainless steel stem and trim, full port design, Type 304 or Type 316 stainless steel fasteners as required in general requirements. Valves shall conform to AWWA C509 and be UL and FM approved.
   b. Shall have internal and external fusion bonded epoxy coating of valve body, including bonnet, per AWWA C550.
   c. Gate shall be encapsulated with EPDM ASTM D2000. It shall be bonded and vulcanized in accordance with ASTM B429 Method B.
   d. Shall have no recesses in valve body.

5. Solid Wedge Metal Seated- Saline Water Service: Tag Type GV5
   a. ANSI Class 150
   b. Body, disc and bonnet shall be cast duplex stainless steel A995, Grade CD3MN.
   c. Stem shall be duplex stainless steel S31803.
   d. Disc and body seat facings shall be hardened.
   e. Stem threads shall be rolled

D. Gate Valves 3 inch and Smaller: Tag Type GV6

1. Gate valves 2.5-in diameter and smaller shall have screwed ends and shall be bronze body. Gate valves 3-in diameter shall be flanged end, iron or bronze body. Gate shall be brass, bronze, or Type 304 stainless steel solid wedge; union bonnet; silicon bronze rising-stem; equal to Jenkins Figure 47CUJ, division of Crane Valve Group; Lunkenheimer Figure 3127, Cincinnati Valve Co, Fairbanks Figure U-0252, or equal. Model numbers referenced

above are for screwed ends, flanged shall be equal construction with appropriate end connections. Iron body valves shall be installed in steel or iron pipelines.

E. Tapping Valves and Sleeves: Tag Type TPGV

1. Under no circumstances shall a standard gate valve be used for a tapping valve. Tapping valves shall comply with the same requirements as solid wedge, resilient seat or double disc gate valves except they shall have the flanged end and port opening modified for tapping service. Tapping valves shall be provided with plugged flush port at bottom of gate guide and plugged tap for pressure/leak testing. Valves shall be capable of passing a full nominal sized cutter without damage to the valve. The tapping sleeve shall be gray cast iron or ductile iron mechanical joint type with the outlet flange conforming to MSS-SP-60.

2.05 PLUG VALVES

A. Eccentric Rectangular Port, Tag Type PV1

1. Plug valves shall be of the offset disc type, 1/4 turn, non-lubricated, serviceable (able to be repacked) under full line pressure and capable of sealing in both directions at the rated pressure. The disc shall be completely out of the flow path when open. Plug valves specified herein shall be manufactured by DeZurik; M&H Valve or approved equal. All manufacturers named or otherwise, must comply completely with this Section.

2. The minimum port area shall be 80 percent when measured by the percent cross-sectional area of equivalent size (nominal same diameter) pipe.

3. All plug valves shall be capable of passing "pigging" cleaning equipment (using a Girard or similar cleaning pig of full nominal pipeline diameter) in either direction and manufacturer shall so certify that this may be done without the use of special equipment.

4. Valves shall be rated at minimum 175 psi WOG (Water, Oil and Gas) working pressure for sizes 4-in to 12-in inclusive and at minimum 150 psi WOG working pressure for sizes 14-in and larger and shall be capable of providing drop tight shut-off to the full valve rating with pressure on either side of the plug.

5. Valves shall be performance, leakage and hydrostatically tested in accordance with AWWA C504, except as modified herein.

6. At the above rated minimum working pressures, the valves shall be certified by the manufacturer as permitting zero leakage for a 5-minute duration with full pressure applied in either direction.

7. At the direction of the Engineer, the valve manufacturer may be requested to perform a valve seat leakage test, witnessed by the Engineer to prove compliance with this Section.

8. Valve bodies shall be of cast iron, 30,000 psi tensile strength, ASTM A126, Grade B, or of ductile iron, ASTM A536 and of the top entry, bolted bonnet design, cast with integral flanges conforming to the connecting piping. All exposed bolts, nuts and washers shall be zinc or cadmium-plated, except for submerged valves, which shall have Type 316 stainless steel hardware.

9. Valve bodies shall be glass lined for plug valves installed in glass lined ductile iron pipelines. Glass lining shall be as specified in the piping specification.

10. The valve plug:
    a. Shall be cast iron ASTM A126, Grade B, or ductile iron, ASTM A536, Grade 65-45-12 with a vulcanized elastomeric coating as specified later herein.
    b. Shall be removable without removing the valve from the line.
    c. Shall have an integral upper and lower shaft which shall have seals on the upper and lower journals to prevent entrance of solids into the journals.
    d. Shall be one piece for all valves.

11. Shaft bearings shall be permanently lubricated stainless steel or bronze at both upper and lower stem journals. The operator shaft shall have easily replaceable seals, which shall be externally adjustable and repackable without removing the bonnet from the valve, or shall have self adjusting packing.

12. The valve seating surface shall provide full 360 degree seating by contact of a resilient seating material on the plug mating with welded-in high nickel content overlay seating surface in the body.

13. The seating design shall be resilient and of the continuous interface type having consistent opening and closing torques and shall be non-jamming in the closed position. Screw-in seats shall not be acceptable.

14. Plugs shall have a full resilient facing of neoprene or Buna-N.

15. Valves 6 inch and larger shall be actuated via gearbox and hand wheel, unless mechanized, which shall require gearbox and actuator. A suitably sized steel actuator mounting bracket shall be provided to provide an air gap between the actuator and the valve stem seal. Under no circumstance shall the gear box be mounted directly to the top body flange such that leakage could directly enter the gear box.

16. Unless otherwise required due to location or mechanized operation, each valve 4-in and smaller shall be provided with its own securely attached lever. Provide adjustable limit stops for both opening and closing and a clearly marked position indicator.

17. Plug valves shall be installed so that the direction of flow through the valve and the shaft orientation is in accordance with the manufacturer's recommendations. Unless otherwise noted, shaft shall be installed horizontal, with plug opening up.

B. Round, Full Port Plug Valves, Tag Type PV2

1. Round full port plug valves shall be equal in all respects as Tag Type PV1 except plug shape shall provide for a round, 100% open area viewing the open valve from the end.

2. Valves 6 inch and larger shall be actuated via gearbox and hand wheel, unless mechanized, which shall require gearbox and motor actuator. A suitably sized steel actuator mounting bracket shall be provided to provide an air gap between the actuator and the valve stem seal. Under no circumstance shall the gear box be mounted directly to the top body flange such that leakage could directly enter the gear box.

3. Valves shall be GA ECO Centric, Pratt Ball Centric, Milliken, or equal.

2.06 CHECK VALVES

A. Iron Body Swing Check Valves for Metallic Lines of 4-in to 30-in Diameter: Tag Type SCV1

1. Check valves shall be swing type and shall meet the requirements of AWWA C508. The valves shall be iron body, bronze mounted, single disc, minimum 175 psi working pressure for 4 to 12 inch, 150 psi working pressure for 14 to 30 inch, non-shock and hydrostatically tested at 300 psi. When there is no flow through the line, the disc shall hang lightly against its seat in practically a vertical position. When open, the disc shall swing clear of the waterway. Valves shall be so constructed that disc and body seat may easily be removed and replaced without removing the valve from the line.

2. Check valves shall have bronze seat and body rings, bronze or ductile clapper arm and bronze nuts on the bolts of bolted covers. Shaft assembly and key shall be A582 Type 416 stainless steel. Hinge shaft shall extend from the body of the valve, sealed with stuffing box, packing and gland. Shaft side plug bearing, stuffing box and gland shall be bronze, packing shall be reinforced Teflon.

3. Valves 6 inch and larger shall be fitted with an extended hinge arm with outside lever and weight. The position of the weight shall be adjustable. Various weights shall be provided and installation approved by the Engineer. Lever shall be installed to the horizontal in the closed position, for both horizontal and vertical pipeline installations.

4. Where check valve position switches are required as shown on the Instrumentation Drawings, check valves shall be furnished complete with position switch mounting bracket and actuation lever mounted to the stem shaft. Where outside lever and weights are required, stem shaft shall extend both sides of the valve body and position switch assembly shall be mounted on the opposite side of the lever and weight assembly.

5. Where position switches are to be supplied for existing check valves with external shaft and lever, supply mounting brackets and hardware required to mount position switches to the existing valves. Contractor shall use existing bolting where possible to mount brackets. If bolting is not available in required area, contractor shall drill and tap valve body if required to mount the position switches. Drill location and depth shall be reviewed with, and approved by the Engineer.

6. Position switches shall be lever type, NEMA 7 enclosure, SPST, 120VAC, 6A, Square D Type 9007CR or approved equal. All hardware shall be Type 316 stainless steel.

7. Check valves shall be manufactured by American Flow Control; M&H/Clow/Kennedy; GA Industries; Mueller or approved equal.

B. Alloy Stainless Steel Swing Check Valves for Saline Water Service: Tag Type SCV2

1. Shall be ANSI 150 Lb design.

2. Body and disc shall be cast duplex stainless steel A995, Grade CD3MN.

3. Hinge shaft and key shall be Nitronic 50 or Alloy 2205 duplex stainless steel Hinge shaft shall extend from the body of the valve, sealed with stuffing box, packing and gland. Shaft side plug bearing, shall be reinforced glass composite or monel, stuffing box shall be Alloy 2205, and gland shall be 316 stainless steel, packing shall be reinforced Teflon, both side plug and stuffing box shall be provided with grease fittings.

4. Lever shall be 304 or 316 stainless steel, weight shall be cast iron or steel.

5. Cover bolting shall be 316 stainless steel, all wetted bolting shall be Nitronic 50 or Alloy 2205.

6. Disc and body seat facings shall be hardened.

7. Where position switches are required, they shall meet requirements of Paragraph 2.08A above.

C. Swing Check Valves 3 inch and Smaller: Tag Type SCV3

1. Check valves 2-in and smaller for installation in copper and steel pipes shall be bronze, swing type, bronze disc, stainless steel pin, 125 lb with solder or screwed ends. Solder or thread end check valves 3-in and smaller shall be similar to Hammond 1B-940, or Jenkins Figure 996. Flanged end check valves 2 to 4-in in water service shall be Bronze fitted Hammond 1R-1124 or Jenkins Figure 587J.

D. Ball Check Valves for Submersible Pump Discharge: Tag Type BCV

1. Body shall be cast iron, ASTM A126, Class B, threaded or flanged. Sinking ball shall be type fabricated of hollow steel with vulcanized Nitrile rubber covering. Ball check valves shall be Type 2016 for up to 3 inch, Type 5087 4 inch and larger, as manufactured by Flygt Corporation, equal by Water Resources Technologies, GA Industries Figure 240/242 or equal.

E. Rubber Flapper Check Valves: Tag Type RFCV

1. Body shall be cast iron, ASTM A126, Class B, or ASTM A536 Gr 65 Ductile iron, 150 lb flanged. Body shall be fusion bonded epoxy coated. Disc shall be Nylon reinforced EPDM encapsulated steel. Valve body and open disc shall provide full flow at least equal to nominal pipe diameter. Seating surface shall be on a 45-degree angle. Top access port shall be full size, allowing disc removal without removing valve body from pipeline. Disc shall be one piece construction, precision molded with and integral o-ring dealing surface and contain steel and nylon reinforcements in both the flex and central disc areas.

2. Rubber flapper check valves shall be as manufactured by Crispin Multiplex Series 500, equal by Val-Matic or equal.

2.07 BALL VALVES: TAG TYPE NOTED BELOW

A. General Service Ball Valves: Tag Type BV1

1. Valves shall be bronze or stainless steel to match the piping material, resilient seated, full port, threaded or solder end three piece bolted body type valves. Manual valves shall have locking levers. The body and cap shall be ASTM B584 brass or 316 stainless steel, SAE Grade 8 steel body bolts, the ball and stem of Type 316 stainless steel and the seats and seals of glass reinforced TFE. The balls shall be full floating, non-lubricated. Valve seats shall be easily accessible and replaceable.

2. Valves shall be Apollo Series 82-100/200, Milwaulkee BA-300 series; or equal.

B. Flanged Iron Body Ball Valves Tag Type BV2

1. Valves shall be cast or ductile iron body with interior and exterior expoxy coating, full port design. Flanges shall be flat faced Class 125 lb, valve face to face dimensions shall be equal to ANSI 16.10 for gate valves. Ball shall be 316 stainless steel or PFA infused cast iron, seats and seals shall be reinforced PTFE. Valves 4 inch and larger shall be provided with gearbox and handwheel.

2. Valves shall be Sureflow type 125BVIS, American Valves Series 4000; or equal

2.08 GLOBE VALVES: TAG TYPE GLV

A. Globe valves 3-in diameter and smaller shall have flanged, or screwed ends as required and shall be bronze body, union or bolted bonnet, renewable full plug stainless steel disc, renewable hardened stainless steel seat ring, rising silicon bronze stem, pressure class 200. Globe valves shall be Figure 3245P as manufactured by Walworth Co.; Valley Forge, PA; Jenkins Figure 592J, division of Crane Valve Group; Stockham Figure B-62; Lunkenheimer Figure 73-PS, Cincinnati Valve Co, Fairbanks Figure 0505, or equal. Model numbers referenced above are for screwed ends, flanged ends shall be provided where shown on drawings and shall be equal construction with appropriate end connections. Iron body valves shall be installed in steel or iron pipelines.

2.09 THERMOPLASTIC VALVES- TAG TYPE NOTED BELOW.

A. General

1. All valves shall be certified as completely compatible with the intended and specified service; compatibility shall apply to the material of the valve and internal components, including all seals, gaskets, O-rings and washers; solvents and primers used in valve joint make-up shall be specifically in conformance with the written instructions of the valve supplier. Service chemicals and service conditions are shown in the piping sections in Division 15.

2. Except as otherwise specified valve ends shall be socket-type designed for solvent welding. Solvent and primer shall be as specified in the piping specifications, except that valves installed in systems carrying strong oxidizing, high alkalinity, and strong acid solutions shall contain NO fumed silica, cement shall be Weld-On 724, primer shall be Weld-On 70 for PVC and CPVC pipe as manufactured by IPS Corp., Compton, CA or Oatey Low VOC EP 42 Heavy Duty Industrial Gray as manufactured by Oatey Corp., Cleveland OH.

3. Valve body material shall be the same as the piping system in which the valve will be installed, unless explicitly stated otherwise on the Drawings or in the valve specification.

a. PVC shall be Type 1, Grade 1, per ASTM D1784 classification, made from unplasticized polymer, and generally suitable for service to 120 degrees F.
b. CPVC shall be Type 4, Grade 1, per ASTM D1784, classification generally suitable for service to 180 degrees F.
c. Polypropylene (PP) shall conform to the material requirements of ASTM D4101 for copolymer polypropylene.
d. PVDF (polyvinylidene fluoride) shall be manufactured from high molecular weight polymers of vinylidene fluoride.
e. The manufacturer of the valves shall retain material source quality documentation and shall furnish it to the Engineer upon request.

4. Unless otherwise specified:
   a. Valve seats shall be Teflon, or Teflon encapsulated elastomer. Alternative materials shall not be substituted without complete documentation provided to the Engineer of service suitability.
   b. Flange Gaskets shall be low torque, full face ANSI B16.5 with two concentric convex rings between ID and bolt hole diameter, constructed of EPDM, PTFE-bonded EPDM or PVDF-bonded EPDM as manufactured by Asahi of America or equal. Flange gaskets shall be appropriate for the fluid service. Documentation shall be provided to show compatibility of the bonded surface material for the fluid service intended.
   c. Valve external hardware shall be Type 316 stainless steel. No internal metallic components shall be exposed to the service fluid.
   d. No factory or field coatings shall be applied to the valves.

5. All valves, except butterfly valves shall have a non-shock service pressure rating of not less than 120 psig at 70 degrees F.

6. All valves shall be given hydrostatic and pressure and leakage tests at the factory. Provide certified copy of test results.

7. Valves shall be the standard, catalogued products of the following manufacturers:
   a. Chemtrol
   b. Asahi/America
   c. Plast-O-Matic
   d. George-Fischer

8. Valves specified as furnished with equipment or equipment systems shall comply with these requirements.

B. Ball Valves: Tag Type Noted Below

1. Ball valves shall be the double-union type, unless otherwise specified, full-port, adjustable seats.

2. Provide quarter-turn manual valve operator unless mechanized actuators are specified on the Drawings.

3. Tag Type TBV1- General Service. Shall be PVC body, furnished with socket ends, EPDM O-rings and stem seals, PTFE seats with EPDM O-ring backup.

4. Tag Type TBV2- Sodium Hypochlorite Service, Emulsion Polymer Service. Shall be PVC body, furnished with socket ends, Viton B O-rings and stem seals, PTFE seats with Viton B O-ring backup. Sodium hypochlorite service ball valves shall have the ball drilled to permit venting of pressure and gas from the confined ball cavity, when the valve is closed. The drilling shall vent to the vented portion of piping in which the valve is installed. The drilling shall be 1/8-in opening, de-burred.

C. Butterfly Valves: Tag Type TBFV

1. Valves shall be of the lined body design with only the liner, seals and disc as wetted parts. The liner shall be molded and formed around the body, functioning as a gasket on each side of the valve. Double O-ring seals on top and bottom disc trunnions will fully isolate a Type 316 stainless steel straight-through stem. Body and disc shall be [PVC, PP, PVDF], Liner (seat) shall be [EPDM, FKM, NBR], o-rings shall be [EPDM, FKM, NBR]. [Note- EPDM is not compatible with oil used in emulsion polymer, and marginally compatible with concentrated sodium hypochlorite. FKM, specifically Viton Grade B shall be used for these applications.]

2. The valves shall be wafer style, and lug style for dead-end service as applicable.

3. Each valve shall be furnished with a lever actuator on sizes through 6-in; gear operator on sizes 8-in and larger.

4. Butterfly valves shall be Type 57 as manufactured by Asahi-America or equal.

D. Diaphragm valves: Tag Type TDV

1. Valves shall have double-union ends. Acid service valves shall have flanged ends.

2. Acid service body and bonnet shall be PVDF, ASTM D3222 Cell Classification Type II.

3. Diaphragms shall be single layer EPDM or Viton as the service requires or shall be two layer, non-laminated. Acid service diaphragms shall be non-laminated, layered EPDM, PVDF gas barrier, PTFE wetted.

4. The valve shall have a full-width weir, designed for throttling, and complete bubble-tight closure.

5. Provide a handwheel valve operator, with a stainless steel stem, a cast stem sleeve and a clear plastic stem cover with a position indicator; provide an adjustable limit stop to prevent over-travel.

6. Diaphragm valves shall be Type 14 as manufactured by Asahi-America or equal.

E. Gate Valves: Tag Type TGV

1. Gate valves 1 ½ inch to 14 inch shall be non-rising stem, PVC body, flanged ends, polypropylene plugs and viton seals. Valves shall be provided with 2 inch operating nut or handwheel as indicated on the Drawings. Valves shall have drain port in the seating area. Valves shall be Type P as manufactured by Asahi-America or equal.

F. Needle Valves: Tag Type TNV

1. Needle valves shall be designed for close control of flow throttling with a multi-turn valve handle. Valves shall have FPM seal, PTFE seat. Stem shall be 20 or 24 pitch for fine throttling control. Valve shall have lugs or panel screw on bonnet for panel mounting.

2. Needle valves shall be as manufactured by Chemline Plastics Limited, George Fischer, or equal.

G. Ball Check Valves: Tag Type TBCV

1. Ball check valves shall be double-union style with socket ends, solid and completely spherical ball, EPDM seals, PTFE seat, capable of either horizontal or vertical mounting.

H. Diaphragm Check Valves: Tag type TDCV

1. Diaphragm check valves shall be union PVC, CPVC or PVDF body, thread or socket weld ends, EPDM or FKM diaphragms. Acid service valves shall be PVDF body with FKM diaphragm, and shall be furnished with PVDF flanges to connect to flanged piping. Valves shall be mountable in any position, and shall be Plast-O-Matic model CKM or equal.

I. Swing Check Valves: Tag Type TSCV

1. Swing check valves shall be flanged body; seats and seals shall be EPDM, FKM or PTFE as required by fluid service; disc serviceable from top entry without removing valve, o-ring sealed top flange, ANSI flanged ends. Outside lever and weight and limit switch mounting shall be provided where shown on the drawings.

J. Backpressure Regulating/Control Valves: Tag Type TBPV

1. Backpressure control valves shall be spring-loaded diaphragm design, fully-adjustable pressure setting, set to assure continuous positive pressure at the pump discharge.

2. Furnish with reinforced Teflon diaphragms and elastomer-coated springs.

3. Body shall be of same material as pipeline in which it is installed or, CPVC if not otherwise specified. Valves shall be manufactured by Plast-O-Matic, or equal.

K. Pressure Relief Valves: Tag Type TPRV

1. Relief valves shall be spring opposed, angle-pattern design, with adjustable relief pressure and locking nut. Pressure shall be adjustable over range up to 100 psig.

2. The valve spring shall be elastomer-coated and isolated from the process flow. Elastomer shall be compatible with the fluid service. Diaphragm shall be reinforced Teflon.

3. Relief valves shall be piped as indicated, and if not indicated, the relief piping shall be directed to the floor or adjacent gutter or drain.

4. Pressure relief valve settings shall be set to a pressure as recommended by the pump or equipment supplier and adjusted at the time of equipment testing, inspection and start-up.

5. Body shall be of same material as pipeline in which it is installed or, CPVC if not otherwise specified. Valves shall be equal to Model RVD by Plast-O-Matic; Type A by Asahi-America or equal.

2.10 NEEDLE VALVES: TAG TYPE NV

A. Needle valves shall have a cast bronze or 18-8 stainless steel body, minimum pressure class 200. Ends shall be ANSI B2.1 threaded. The valves shall have a rising bronze stem and non-slip resilient rubber-coated malleable iron hand wheel.

B. The needle valves shall be Figure 1976 as manufactured by the William Powell Company, Cincinnati, OH, or Figure 88 as manufactured by Crane Company, Valve Division, Chicago, IL; Lunkenheimer Figure 906-BS or equal.

2.11 PRESSURE REGULATING VALVES: TAG TYPE PCV

A. Pressure regulating valves shall be factory tested. Outlet pressure shall be easily field-adjustable over the pressure ranges and criteria noted on the Drawings.

B. Threaded pressure regulating valves shall have unions mounted in the pipe on each side of the valve.

C. Strainers shall be provided up stream of all pilot valves and hydraulic components associated with the main valve. The pressure regulating valve manufacturer shall specify the screen mesh or size of perforations that are required to protect the regulating valve or hydraulic component. Strainers shall be constructed of 316 stainless steel.

D. Pressure Regulating Valves - 3-in and larger

1. Valves 3-in and larger and for pressure regulating shall be flanged with globe body, fully bronze mounted, external pilot operated, spring-loaded diaphragm type single seat with seat base equal to size of valve and shall be equal to the Figure x-4500D (with an industrial chrome finish) Pressure Reducing Valve as manufactured by GA Industries Inc., Pittsburgh, PA; Clayton Model 90 by Cla-Val Company, Newport Beach, CA; Bailey, Fresno, CA; similar models by Ross; OCV; Watts/Muesecos or equal.

2. The valve shall be packed with leather material acceptable to the Engineer to ensure tight closure and prevent metal to metal friction and sticking. The valve shall be furnished with indicator rod, to show position of opening of the piston, and pet cocks for attachment to valve body for receiving gauges for testing purposes.

3. The pilot valve, controlling operation of the main valve, shall be easily accessible and so arranged to allow for its removal from the main valve, while the main valve is under pressure. The pilot valve shall be easily adjustable without removal of the springs, weights or use of special tools. The control piping on the valves shall have strainers to prevent plugging of control mechanisms.

4. The design shall be such that repairs and dismantling internally of main valve may be made without its removal from the line.

5. The unit shall be flanged. The valve body shall be constructed of cast iron.

6. The valve shall maintain pre-adjusted downstream pressure for varying rates of flow through the positioning of the diaphragm by the pilot without causing: water hammer or waste of water and without cavitation.

E. Pressure Regulating Valves - 2-in and Smaller

1. Pressure regulating valves 2-in and smaller shall be rated 150 psig working pressure, with bronze and brass body; renewable stainless steel seat and flexible diaphragm of suitable material. Outlet pressure shall be easily field-adjustable over the pressure ranges tabulated.

2. Pressure regulating valves 2-in and smaller shall be Figure No. 43D as manufactured by GA Industries, Inc.; Watts Muesco Regulator Co. Series 115 for 1-1/4-in and larger and Model 223-S for units smaller than 1-1/4-in or equal with strainer and of size noted on the Drawing. Shall be diaphragm type, pressure reducing globe valves designed for an inlet pressure of approximately 110 psig, and outlet pressures in the range of 20 to 60 psig

2.12 SOLENOID VALVES: TAG TYPE SV

A. Solenoid valves shall be packless piston type direct acting for sizes less than 1-in and internal pilot operated for sizes 1-in and larger, 2-way or 3-way, valves and shall be ASCO Valve; Red Hat by Automatic Switch Co., similar by Circle Seal Controls-Atkomatic Valve Co. or equal for air and water service.

B. Valves shall be energized to open, except for valves on water seal lines to pumps which shall be energize to close.

C. Valves shall have forged brass bodies, NPT end connections of the connected piping Type 304 stainless steel internal parts, and Buna-N or Ethylene Propylene valve seats. Valves shall have a minimum 150 psig safe working pressure and zero minimum operating pressure differential. Connections shall be threaded.

D. Solenoid valves size 2-inch and larger shall be full bore bronze body, Type 430 stainless steel plunger, copper coil class A encapsulated, Type 302 stainless steel spring, wash-down safe, equal to type A as manufactured by Magnatrol Valve Corp., Hawthorne, NJ or equal. Solenoid valves shall have a manual override actuated by a handle levered plunger mounted on the bottom of the valve body. These valves must be mounted in a horizontal run of piping, with the solenoid up in the vertical position.

E. Note that solenoid valves may be shown on Electrical and/or Mechanical Drawings, or may only be specified, but if so specified or shown, shall be provided. Solenoid valves located in hazardous classified areas shall be provided with electrical enclosures which satisfy the electrical classification as specified or shown on the electrical drawings.

2.13 CORPORATION STOPS: TAG TYPE CS

A. 3/4" through 2" Corporation Stops shall be ball valve type, meeting AWWA Standard C800-01, Sec. 4.2.3 (High Pressure), withstanding working pressures up to 300 psi. The body, ball, operating stem, T-head, and service line connector shall be manufactured from red brass and conform to ASTM B62 and/or ASTM B584, UNS No. C83600. The ball shall be fluorocarbon coated and shall float on two EPDM seats and be watertight in both directions. The operating stem and nut shall be one piece, held in place by a mating machined flange on the stem and in

the body. The operating stem shall have an EPDM O-ring to provide a watertight seal against the body.

B. Inlet threads shall be AWWA Taper, except where used with service clamps, where threads shall be IPS threads. All thread types and diameters shall conform to AWWA C800. The inlet threads will be integral to the body. The waterway diameter shall be approximately equivalent to the nominal size of the stop, and shall accommodate the maximum cutter size established by AWWA C800. The outlet shall be a compression connection meeting AWWA C800 Sec. 4.4.9.

C. Corporation Stops shall be FB Style Ballcorp, as manufactured by The Ford Meter Box Company, Inc., Wabash, Indiana, or equal. Where corporation stops are used with plastic pipe, a brass companion flange shall be provided on the outlet of each corporation stop.

2.14 AIR RELEASE AND VACUUM RELIEF VALVES: TAG TYPE NOTED BELOW

A. All pipeline air and vacuum valves shall be supplied with isolation gate or ball valves with operator handle or lever removed. Isolation valves shall be of same metallurgy as the connecting piping or nipples.

B. Relief valves shall be properly vented and piped to drain.

C. Valve pressure rating shall be at least equal to the attached pipe's rating.

D. Air and Vacuum valves for sewage service shall have connections for draining and flushing with isolation ball valves for connection size up to 3 inch, and solid wedge gate valves for size 4 inch and larger.

E. Combination Air and Vacuum Relief Valves: Tag Type CAV1

1. Valves shall be single body, guided float design configured to release large amounts of air during pipeline filling, release small amounts of air accumulated during pipeline operation, and allow large volume of air entry during pipeline draining or vacuum transients. Single or segmented float shall be stainless steel or solid thermoplastic and shall not deform under any operating condions. The body and float design shall limit the transient pressure rise to not more than twice the valve working pressure. Valve design shall incorporate an over pressure safety feature that will fail without an explosive effect, such as is normally the case when highly compressed air is released suddenly. Valves shall have intake area equal to nominal size of the valve. Valve bodies shall be smooth contoured for solids flushing, and shall have ports for flush and drain. Valve body shall be easily dismantled with single split coupling, top entry bolted flange or be of cylindrical construction with flanged ends secured with external tie rods. Valves shall be rated for 250 psi service pressure.

2. Materials and Manufacturer:
   a. Body shall be ductile iron, 304 stainless steel or 316 stainless steel.
   b. Floats shall be HDPE or 316 stainless steel
   c. Internal wetted components shall be 316 stainless steel
   d. Seals and elastomers shall be EPDM.
   e. External bolting shall be 316 stainless steel
   f. Manufacturer shall be Dezurik/APCO ASU, Vent-O-Mat RGX II, A.R.I. D-026, Dorit DAV.

2.15 SURFACE PREPARATION AND SHOP COATINGS

A. Not withstanding any of these specified requirements, all coatings and lubricants in contact with potable water shall be certified as acceptable for use with that fluid.

B. If not specified herein, coatings shall comply with the requirements of Section 09901 and 09902. In case of a conflict, the requirements of this Section govern.

C. If the manufacturer's requirement is not to require finished coating on any interior surfaces, then manufacturer shall so state and no interior finish coating will be required, if acceptable to the Engineer.

D. The exterior surface of various parts of valves, operators, floor-stands and miscellaneous piping shall be thoroughly cleaned of all scale, dirt, grease or other foreign matter and thereafter one shop coat of an approved rust-inhibitive primer such as Inertol Primer No. 621 shall be applied in accordance with the instructions of the paint manufacturer or other primer compatible with the finish coat provided.

E. Unless otherwise noted, interior ferrous surfaces of all valves shall be given a shop finish of an asphalt varnish conforming to AWWA C509, (except mounting faces/surfaces) or epoxy conforming to AWWA C550 with a minimum thickness of 6 mil.

F. Ferrous surfaces obviously not to be painted shall be given a shop coat of grease or other suitable rust-resistant coating. Mounting surfaces shall be especially coated with a rust preventative.

G. Special care shall be taken to protect uncoated items and plastic items, especially from environmental damage.

2.16 FACTORY INSPECTION AND TESTING

A. Factory inspection, testing and correction of deficiencies shall be done in accordance with the referenced standards and as noted herein.

B. See Division 1 for additional requirements. Also refer to PART 1, especially for required submission of test data to the Engineer.

C. In addition to all tests required by the referenced standards, the following shall also be factory tested:
   1. Pressure regulating valves shall be factory tested at the specified pressures and flows.
   2. Butterfly valves shall be factory tested to demonstrate drop tight closure at the specified conditions.
   3. All types of air and vacuum valves.

PART 3: EXECUTION

3.01 INSTALLATION - GENERAL

A. All valves and appurtenances shall be installed per the manufacturer's instructions in the locations shown, true to alignment and rigidly supported. Gearboxes, electric, hydraulic and

pneumatic actuators shall be installed at the valve suppliers facility, completely adjusted and tested. Valve and actuator assemblies shall not be mated in the field under any circumstance.

B. In no case shall stems be installed upside down- or vertical in the 6 o'clock position. Unless otherwise indicated on the Drawings:

1. Gate, Globe, Ball valves shall be installed with stem vertical in the 12 o'clock position.

2. Plug valves shall be installed with stem horizontal and plug opening to the top of the body unless position will not allow proper actuator access, in which case stem shall be vertical in the 12 o'clock postion.

3. Plug valves in horizontal lines shall be installed with the seat upstream. Plug valves in vertical lines shal be installed with the seat facing up.

C. Install all brackets, extension rods, guides, the various types of operators and appurtenances as shown on the Drawings, or otherwise required. Before setting these items, check all Drawings and figures which have a direct bearing on their location. The Contractor shall be responsible for the proper location of valves and appurtenances during the construction of the work.

D. All materials shall be carefully inspected for defects in construction and materials. All debris and foreign material shall be cleaned out of openings, etc. All valve flange covers shall remain in place until connected piping is in place. All operating mechanisms shall be operated to check their proper functioning and all nuts and bolts checked for tightness. Valves and other equipment which do not operate easily, or are otherwise defective, shall be repaired or replaced at no additional cost to the Owner.

E. Where installation is covered by a referenced standard, installation shall be in accordance with that standard, except as herein modified, and the Contractor shall certify such. Also note additional requirements in other parts of this Section.

F. Unless otherwise noted, joints for valves and appurtenances shall be made up utilizing the same procedures as specified under the applicable type connecting pipe joint and all valves and other items shall be installed in the proper position as recommended by the manufacturer. Contractor shall be responsible for verifying manufacturers' torquing requirements for all valves.

3.02 INSTALLATION OF MANUAL OPERATIONAL DEVICES

A. Unless otherwise noted, all operational devices shall be installed with the units of the factory, as shown on the Drawings or as acceptable to the Engineer to allow accessibility to operate and maintain the item and to prevent interference with other piping, valves and appurtenances.

B. For manually operated valves 3-inch diameter and smaller, valve operators and indicators shall be rotated to display toward normal operation locations.

C. Floor boxes, valve boxes, extension stems and low floor stands shall be installed vertically centered over the operating nut, with couplings as required and the elevation of the box top shall be adjusted to conform to the elevation of the finished floor surface or grade at the completion of the Contract. Boxes and stem guides shall be adequately supported during concrete placement to maintain vertical alignment.

3.03 INSPECTION, TESTING AND CORRECTION OF DEFICIENCIES

A. See also Division 1. Take care not to over pressure valves or appurtenances during pipe testing. If any unit proves to be defective, it shall be replaced or repaired to the satisfaction of the Engineer.

B. Functional Test: Prior to plant startup, all items shall be inspected for proper alignment, quiet operation, proper connection and satisfactory performance. After installation, all manual valves shall be opened and closed in the presence of the Engineer to show the valve operates smoothly from full open to full close and without leakage. Valves equipped with electric, pneumatic or hydraulic actuators shall by cycled 5 times from full open to full closed in the presence of the Engineer without vibration, jamming, leakage, or overheating. Pressure control and pressure relief valves shall be operated in the presence of the Engineer to show they perform their specified function at some time prior to placing the piping system in operation and as agreed during construction coordination meetings

C. The various pipe lines in which the valves and appurtenances are to be installed are specified to be field tested. During these tests any defective valve or appurtenance shall be adjusted, removed and replaced, or otherwise made acceptable to the Engineer. Various regulating valves, strainers, or other appurtenances shall be tested to demonstrate their conformance with the specified operational capabilities and any deficiencies shall be corrected or the device replaced or otherwise made acceptable to the Engineer

3.04 CLEANING

A. All items including valve interiors shall be inspected before line closure, for the presence of debris. At the option of the Engineer, internal inspection of valve and appurtenances may be required any time that the likelihood of debris is a possibility. All pipes and valves shall be cleaned prior to installation, testing disinfection and final acceptance.

3.05 DISINFECTION

A. Disinfection of valves and appurtenances on all potable water lines and where otherwise noted, shall be as noted in Paragraph 1.02B above.

END OF SECTION

SECTION 15101

VALVE SCHEDULE

PVSC 15-DIGIT ASSET I.D. NUMBER DESIGNATION	CONTRACT DRAWINGS VALVE DESIGNATION	VALVE SIZE	VALVE TYPE	VALVE OPERATOR	JOINT CONNECTION	REMARKS
	BV 511-514	10-INCH	BV2	HW	FLG	
	FCV 511-514	10-INCH	PV2	MO	FLG	Re-use existing actuators
	PV 511-514	10-INCH	PV2	HW	FLG	
	PV-515	16-INCH	PV2	HW	FLG OR VIC	
	PV-516	16-INCH	PV2	HW	FLG OR VIC	
	PV-517	16-INCH	PV2	HW	FLG OR VIC	
	CAV 1-1	3-INCH	CAV1	NA	THD	3 inch BV1 isolation
	CAV 1-2	3-INCH	CAV1	N/A	THD	3 inch BV1 isolation
	CAV 1-3	3-INCH	CAV1	N/A	THD	3 inch BV1 isolation
	CAV 1-4	3-INCH	CAV1	N/A	THD	3 inch BV1 isolation

VALVE DESIGNATION

HTPSR – Heat Treatment Plant Supernatant Return
STSR – Sludge Thickener Supernatant Return
WSL – Waste Sludge
WSL-CSL – Waste Sludge & Chemical Sludge
NPW – Non-Potable Water

VALVE TYPES

BV – Ball Valve
CAV – Combination Air Valve
KGV – Knife Gate Valve
PV – Plug Valve

TYPE OF OPERATION

HW – Hand Wheel Operated
MO – Motor Operated

JOINT CONNECTION

FLG – Flanged
THD – Threaded
WAFER – Mount between flanges

Not Guaranteed Complete – Contractor shall provide all valves and actuators as shown on the Drawings and as Specified.