

ALS Waiver Request for Plunger Valves

General Items

Project Name

Duchesne Aqueduct Improvement Project

Description of Work

The Central Utah Water Conservancy District (CUWCD) owns and operates the Duchesne Valley Water Treatment Plant (DVWTP) located in Duchesne County, Utah. CUWCD operates as a regional water wholesaler and owns and manages the DVWTP. The DVWTP is located near Duchesne, Utah and adjacent to Starvation Reservoir as shown in Figure 1.

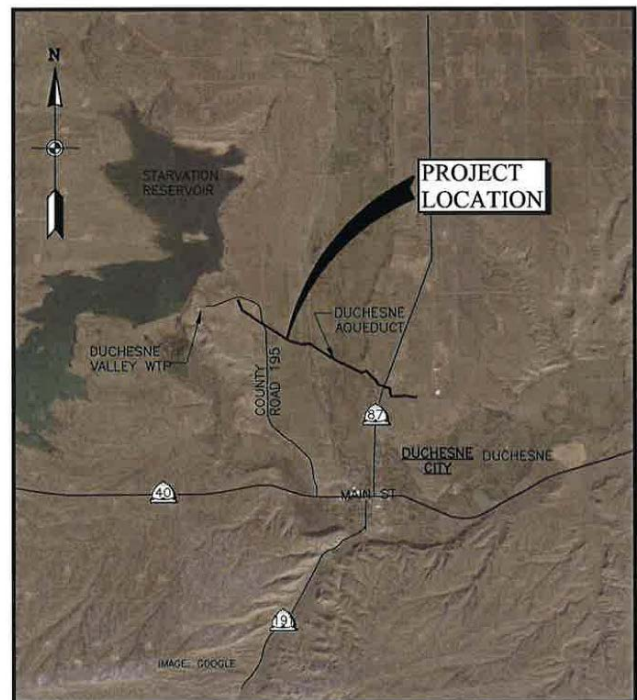
CUWCD also owns and operates the Duchesne Aqueduct that carries finished water from DVWTP to residents and businesses within Duchesne County (see Figure 2). The Duchesne Aqueduct was originally constructed in 1980 and CUWCD's ownership of the aqueduct is approximately 2.3 miles in length and ranges from 20-inches to 18-inches in diameter.

CUWCD conducted an assessment of the Duchesne Aqueduct in 2018 and determined that the aqueduct needed upgrades and improvements. These are listed below:

- Vault reconstruction:
 - West Bench Tank Turnout and Bypass
 - Duchesne Aqueduct Meter Vault
 - River Road Turnout
 - Farm Road Turnout
 - Blue Bench Turnout
 - Road Shed Interconnection and Turnout
- Approximate lengths of the following welded steel pipes ("WSP"):
 - 325 lineal feet of 30-inch WSP (West Bench Tank Turnout and Bypass)
 - 275 lineal feet of 20-inch WSP (Duchesne Aqueduct Meter Vault and River Road



Figure 1. Duchesne Valley Water Treatment Plant



PROJECT VICINITY MAP

Figure 2 Duchesne Aqueduct

- Turnout)
 - 535 lineal feet of 18-inch WSP (River Road Turnout, Blue Bench Turnout, and Road Shed Interconnect)
 - 25 lineal feet of 12-inch WSP (West Bench Tank Turnout and Bypass)
 - 215 lineal feet of 8-inch WSP (West Bench Tank Turnout and Bypass, River Road Turnout, and Road Shed Interconnect)
- Approximately 320 lineal feet of 8-inch DR18 C900 PVC for the Duchesne City waterline loop.
 - Construction on a steep grade between connection in Hillside Avenue and top of hill near the Farm Road Turnout Vault
 - Crossing under the Rock Point Ditch Company 60-inch steel pipe
- Replacement/new mainline Duchesne Aqueduct air vacuum valves and vaults
- New Duchesne Aqueduct blow-off within the River Road Turnout Vault
- Reconstruction of existing Duchesne River blow-off
- New 12-foot wide access road about 1,000 lineal feet to the Duchesne River blow-off
- Associated aqueduct appurtenances including air vacuum valves, valves, and other appurtenances within the above listed vaults.
- Conduct final testing, training, warranty and startup services.
- Removal of deep-rooted vegetation within the Duchesne Aqueduct right-of-way and easements

Description of the Foreign and Domestic Construction Materials

The plans and specifications require the use of five plunger valves: three 8-inch to two 12-inch. The plunger valves are constructed of stainless steel, bronze, and ductile iron and must be designed to withstand high velocities. Plunger valves are produced internationally but there are no domestic manufacturers that can meet the required specifications within the United States.

Plunger valves are used to control either pressure or flow in a water system. The purpose in this project is to control pressure at metered connections to retail water users. If downstream system demands during peak water supply events go beyond the customer contracted peak delivery rates and create a significant pressure loss in the pipeline, the plunger valve can be controlled through logic controllers to limit flows at the customer turn-outs preventing insufficient system pressures. These valves provide a higher quality project, enhanced system control, and lower maintenance requirements and costs. In addition, they are compact and require much less space than conventional pressure regulating valves. The project Owner has limited staff resources for maintenance of the project. Plunger Valves require less maintenance than typical pressure regulating valves. Currently there are zero domestic producers of plunger valves.

Unit of Measure

The valves listed above are measured by 'each'.

Quantity

A total of 5 plunger valves listed in the table below.

Price

Plunger Valves			
Size (inch)	Quantity	Unit Price	Total Costs
8	3		
12	2		
Total	5		

Time of delivery and availability

Delivery time of the plunger valves is not applicable to this waiver. However, plunger valves that meet the required specifications are not fabricated domestically in the United States.

For similar projects, the EPA conducted market research on the supply and availability of plunger valves and concluded that there are no domestic manufacturers of these valves that meet the technical specifications of those projects (similar to the Duchesne Aqueduct Improvement Project specifications).

Location of the construction project

The project is located in Duchesne County, Utah as described above.

Name and address of the proposed supplier

Rocky Mountain Valve
1310 South Swaner Road
Salt Lake City UT. 84104

A detailed justification for the use of foreign construction materials

Plunger valves are needed to control the pressure and flow of the water transmission system to prevent customers connected to the transmission system from seeing a decrease in pressure if flows exceed the design rates. The plunger valves specified are not manufactured domestically in the United States. The plunger valve's main design features including compact valve design, linear flow characteristics, and custom outlet configurations. All of these characteristics have contributed to the successful application of plunger valves to date in the water delivery industry. The plunger valve has performed superbly over other valves in the areas of anti-cavitation, noise and vibration reduction, debris passage, closure tightness, operational reliability, durability, and life-cycle cost efficiency. The plunger valve responds well in terms of technical soundness, operations and maintenance requirements, and valve economics for handling energy dissipation and/or flow regulation, particularly under severe flow conditions.

Availability Waiver Request for Plunger Valves

Supplier information or pricing information from a reasonable number of domestic suppliers indicating availability/delivery date for construction materials

The plunger valves specified are not manufactured domestically in the United States. There are no domestically manufactured replacement valves that would meet the specifications for the Duchesne Aqueduct Improvement Project.

For similar projects, the EPA conducted market research on the supply and availability of plunger valves and concluded that there are no domestic manufacturers of these valves that meet the technical specifications of those projects (similar to the Duchesne Aqueduct Improvement Project specifications).

Documentation of the assistance recipient's efforts to find available domestic sources, such as description of the process for identifying suppliers and a list of contacted suppliers

CUWCD requested that the prime contractor, WW Clyde, contact domestic suppliers of plunger valves. However, WW Clyde indicated that there are no domestic suppliers for plunger valves that meet the project plans and specifications. WW Clyde's response attached.

Project Schedule

See attached

Relevant excerpts from project

See attached



January 10, 2020

Chris Elison
Central Utah Water Conservancy District
1426 E 750 N Suite 400
Orem, UT 84097

Re: Duchesne Aqueduct Improvement Project
Subject: AIS Waiver Prime Contractor Statement

Dear Chris,

The intention of the letter is to inform Central Utah Water Conservancy that the following permanent construction materials specified for the construction of the Duchene Aqueduct Improvement Project are not available from domestic suppliers.

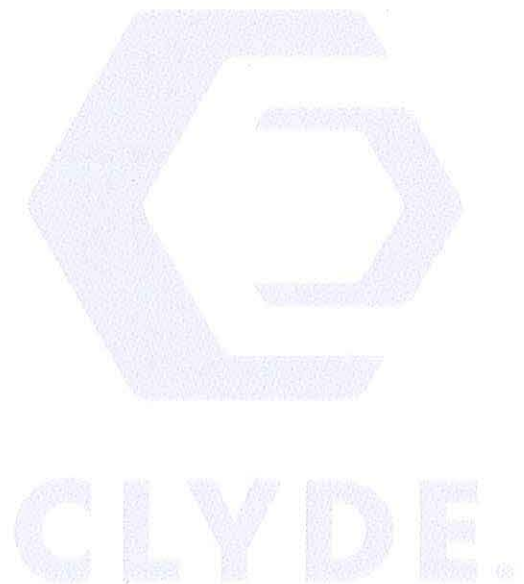
WW Clyde & Co. in an effort to meet the AIS requirements, has requested pricing for domestically produced double offset butterfly valves and plunger vales per specification 15202 and 15208 from the following suppliers Core and Main, HD Fowler, and Waterford. The suppliers have stated that the specified valves are not available from a domestic manufacturing source. The only manufactures currently producing the specified double offset valves and plunger vales are VAG Armaturen and AV-TEK.

Sincerely;

A handwritten signature in blue ink, appearing to read "Jeff Whinham", written over a faint, stylized blue graphic that resembles a large letter 'C'.

Jeff Whinham
Project Manager

C.C Project Files



**SECTION 15200
VALVES, GENERAL**

PART 1 - GENERAL

1.1 SUMMARY

- A. The Contractor shall provide valves, actuators, and appurtenances, complete and operable, in accordance with the Contract Documents.
- B. The requirements of Section 11000 - Equipment General Provisions, apply to the Work of this Section.
- C. The provisions of this Section shall apply to all valves and valve actuators except where otherwise indicated. Valves and actuators in particular locations may require a combination of units, sensors, limit switches, and controls indicated in other Sections of the Specifications.
- D. Where a valve is to be supported by means other than the piping to which it is attached, the Contractor shall obtain from the valve manufacturer a design for support and foundation that satisfies the criteria in Section 11000. The design, including drawings and calculations sealed by an engineer, shall be submitted with the Shop Drawings. When the design is approved, the support shall be provided.
- E. Unit Responsibility: A single manufacturer shall be made responsible for coordination of design, assembly, testing, and furnishing of each valve; however, the Contractor shall be responsible to the Owner for compliance with the requirements of each valve section. Unless indicated otherwise, the responsible manufacturer shall be the manufacturer of the valve.
- F. Single Manufacturer: Where two or more valves of the same type and size are required, the valves shall be furnished by the same manufacturer.

1.2 CONTRACTOR SUBMITTALS

- A. Furnish submittals in accordance with Section 01300 – Contractor Submittals
- B. Shop Drawings: Shop Drawings shall contain the following information:
 - 1. Valve name, size, Cv factor, pressure rating, identification number (if any), and specification section number.
 - 2. Complete information on valve actuator, including size, manufacturer, model number, limit switches, and mounting.
 - 3. Cavitation limits for control valves.
 - 4. Assembly drawings showing part nomenclature, materials, dimensions, weights, and relationships of valve handles, handwheels, position indicators, limit switches, integral control systems, needle valves, and control systems.
 - 5. Data in accordance with Section 15201- Valve and Gate Actuators for electric motor-actuated valves.
 - 6. Complete wiring diagrams and control system schematics.
 - 7. Valve Labeling: A schedule of valves to be furnished with stainless steel tags, indicating in each case the valve location and the proposed wording for the label.

- C. Technical Manual: The Technical Manual shall contain the required information for each valve.
- D. Spare Parts List: A Spare Parts List shall contain the required information for each valve assembly, where indicated.
- E. Factory Test Data: Where indicated, signed, dated, and certified factory test data for each valve requiring certification shall be submitted before shipment of the valve. The data shall also include certification of quality and test results for factory-applied coatings.

PART 2 - PRODUCTS

2.1 PRODUCTS

- A. General: Valves and gates shall be new and of current manufacture. Shut-off valves 6-inches and larger shall have actuators with position indicators. Gate valves 18-inches and larger or where chain wheel is required, shall be furnished with spur gear and hand wheel. Buried valves shall be provided with valve boxes and covers containing position indicators and valve extensions. Manual shut-off valves mounted higher than 7-feet above working level shall be provided with chain actuators.
- B. Valve Actuators: Unless otherwise indicated, valve actuators shall be in accordance with Section 15201 - Valve and Gate Actuators.
- C. Protective Coating: The exterior surfaces of all valves and the wet interior surfaces of ferrous valves of sizes 4-inches and larger shall be epoxy coated in accordance with Section 09910 - Pipeline Coating and Linings. The valve manufacturer shall certify in writing that the required coating has been applied and tested in the manufacturing plant prior to shipment, in accordance with these Specifications. Flange faces of valves shall not be epoxy coated.
- D. Valve Labeling: Except when such requirement is waived by the construction manager in writing, a label shall be provided on shut-off valves and control valves except for hose bibbs and chlorine cylinder valves. The label shall be of 1/16-inch plastic or stainless steel, minimum 2-inches by 4-inches in size, as indicated in Section 15005 - Identification for Piping and Equipment and shall be permanently attached to the valve or on the wall adjacent to the valve as directed by the construction manager.
- E. Valve Testing: As a minimum, unless otherwise indicated or recommended by the reference Standards, valves 3-inches in diameter and smaller shall be tested in accordance with manufacturer's standard and 4-inches in diameter and larger shall be factory tested as follows:
 - 1. Hydrostatic Testing: Valve bodies shall be subjected to internal hydrostatic pressure equivalent to twice the water rated pressure of the valve. Metallic valves rating pressures shall be at 100 degrees F and plastic valves shall be 73 degrees, or at higher temperature according to type of material. During the hydrostatic test, there shall be no leakage through the valve body, end joints, or shaft seals, nor shall any part of the valve be permanently deformed. The duration shall be sufficient time to allow visual examination for leakage. Test duration shall be at least 10 minutes.

2. Seat Testing: Valves shall be tested for leaks in the closed position with the pressure differential across the seat equal to the water rated pressure of the valve. The duration of test shall be sufficient time to allow visual examination for leakage. Test duration shall be at least 10 minutes. Leakage past the closed valve shall not exceed 1 fluid ounce per hour per inch diameter for metal seated valves and drop-tight for resilient seated valves.
 3. Performance Testing: Valves shall be shop operated from fully closed to fully open position and reverse under no-flow conditions in order to demonstrate the valve assembly operates properly.
- F. Certification: Prior to shipment, the Contractor shall submit for valves over 12-inches in size, certified, notarized copies of the hydrostatic factory tests, showing compliance with the applicable standards of AWWA, ANSI, or ASTM.
- G. Valve Marking: Valve bodies shall be permanently marked in accordance with MSS SP25 - Standard Marking Systems for Valves, Fittings, Flanges, and Unions.

2.2 MATERIALS

- A. General: Materials shall be suitable for the intended application. Materials in contact with potable water shall be listed as compliant with NSF Standard 61. Materials not indicated shall be high-grade standard commercial quality, free from defects and imperfections that might affect the serviceability of the product for the purpose for which it is intended. Unless otherwise indicated, valve and actuator bodies shall conform to the following requirements:
1. Cast Iron: Close-grained gray cast iron, conforming to ASTM A 48 - Gray Iron Castings, Class 30, or to ASTM A 126 - Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
 2. Ductile Iron: ASTM A 536 - Ductile Iron Castings, or to ASTM A 395 - Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures.
 3. Steel: ASTM A 216 - Steel Castings, Carbon Suitable for Fusion Welding for High-Temperature Service, or to ASTM A 515 - Pressure Vessel Plates, Carbon Steel, for Intermediate- and Higher-Temperature Service.
 4. Bronze: ASTM B 62 - Composition Bronze or Ounce Metal Castings, and valve stems not subject to dezincification shall conform to ASTM B 584 - Copper Alloy Sand Castings for General Applications.
 5. Stainless Steel: Stainless steel valve and operator bodies and trim shall conform to ASTM A 351 - Steel Castings, Austenitic, for High-Temperature Service, Grade CF8M, or shall be Type 316 stainless steel.
 6. PVC: Poly Vinyl Chloride materials for valve body, flanges, and cover shall conform to Cell Classification 12454.
 7. CPVC: Chlorinated Poly Vinyl Chloride materials for valve body, flanges, and cover shall conform to Cell Classification 23447.
 8. NSF Standard 14: Materials shall be listed for use in contact with potable water.

2.3 VALVE CONSTRUCTION

- A. Bodies: Valve bodies shall be cast, molded (in the case of plastic valves), forged, or welded of the materials indicated, with smooth interior passages. Wall thicknesses shall be uniform in agreement with the applicable standards for each type of valve, without casting defects, pinholes, or other defects that could weaken the body. Welds on welded bodies shall be done

by certified welders and shall be ground smooth. Valve ends shall be as indicated, and be rated for the maximum temperature and pressure to which the valve will be subjected.

- B. Valve End Connections: Unless otherwise indicated, valves 2-1/2 inches diameter and smaller may be provided with threaded end connections. Valves 3-inches and larger shall have flanged end connections.
- C. Bonnets: Valve bonnets shall be clamped, screwed, or flanged to the body and shall be of the same material, temperature, and pressure rating as the body. The bonnets shall have provision for the stem seal with the necessary glands, packing nuts, or yokes.
- D. Stems: Valve stems shall be of the materials indicated, or, if not indicated, of the best commercial material for the specific service, with adjustable stem packing, O-rings, Chevron V-type packing, or other suitable seal. Bronze valve stems shall conform to ASTM B 584, except that zinc content shall not exceed 16 percent.
- E. Stem Guides: Stem guides shall be provided, spaced 10-feet on centers unless the manufacturer can demonstrate by calculation that a different spacing is acceptable. Submerged stem guides shall be 304 stainless steel.
- F. Internal Parts: Internal parts and valve trim shall be as indicated for each individual valve. Where not indicated, valve trim shall be of Type 316 stainless steel or other best suited material.
- G. Nuts and Bolts: Nuts and bolts on valve flanges and supports shall be in accordance with Section 05500 – Metal Fabrications.

2.4 VALVE ACCESSORIES

- A. Valves shall be furnished complete with the accessories required to provide a functional system.

2.5 SPARE PARTS

- A. The Contractor shall furnish the required spare parts suitably packaged and labeled with the valve name, location, and identification number. The Contractor shall also furnish the name, address, and telephone number of the nearest distributor for the spare parts of each valve. Spare parts are intended for use by the Owner, after expiration of the correction of defects period.

2.6 MANUFACTURERS

- A. Manufacturer's Qualifications: Valve manufacturers shall have a successful record of not less than 5 years in the manufacture of the valves indicated.

PART 3 - EXECUTION

3.1 VALVE INSTALLATION

- A. General: Valves, actuating units, stem extensions, valve boxes, and accessories shall be installed in accordance with the manufacturer's written instructions and as indicated. Gates shall be adequately braced to prevent warpage and bending under the intended use. Valves shall be firmly supported to avoid undue stresses on the pipe.
- B. Access: Valves shall be installed with easy access for actuation, removal, and maintenance and to avoid interference between valve actuators and structural members, handrails, or other equipment.
- C. Valve Accessories: Where combinations of valves, sensors, switches, and controls are indicated, the Contractor shall properly assemble and install such items so that systems are compatible and operating properly. The relationship between interrelated items shall be clearly noted on Shop Drawing submittals.

END OF SECTION

**SECTION 15208
PLUNGER VALVES**

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Furnish horizontal in-line Plunger Valve complete with electric actuator for modulating service for independent flow control.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 15200 – Valves General
- B. Section 15201 – Valve and Gate Actuators
- C. Section 09900 – Protective Coatings
- B. Section 09910 – Pipeline Coatings and Linings

1.3 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. American National Standards Institute (ANSI)
 - B1.20.1 Pipe Threads, General Purpose (Inch)
 - B16.1 Cast Iron Pipe Flanges and Flanged Fittings
 - B16.5 Steel Pipe Flanges and Flanged Fittings
- B. American Society for Testing and Materials (ASTM)
 - A48 Specification for Gray Iron Castings
 - A182 Standard Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service
 - A216 Specification for Steel Castings, Alloy, Specially Heat-Treated, for Pressure-Containing Parts, Suitable for High-Temperature Service.
 - A536 Specification for Common Requirements for Iron Castings for General Industrial Use.
 - A743 Specification for Castings, Iron-Chromium, Iron-Chromium-Nickel, Corrosion Resistant, for General Application
- C. American Iron and Steel Institute (AISI)
 - AISI 304 Austenitic Stainless Steel (maximum percent: 0.08C, 2.0 Mn, 1.0 Si, 18-20 Cr, 8-10.5 Ni)

AISI 420 Martensitic Stainless Steel (minimum percent: 0.15C, maximum percent: 1.0 Mn, 1.0 Si, 12-14 Cr, 0.0 Ni,)

- D. European (EN or DIN) standards equivalent to referenced American standards; subject to Engineer approval.
- E. Purchaser Furnished Data: Operating Conditions, design criteria, process criteria, and facility drawings shall be provided to allow the manufacturer to properly design customize Plunger Valve performance.

1.4 SUBMITTALS

- A. Submittals shall be made in accordance with Section 01300 Contractor Submittals, and as indicated herein.
- B. Submit Manufacturer's data and descriptive literature written in the English language and in US Imperial units. Include catalog data, preliminary performance testing procedures, quality control procedures, calculations, detailed construction sheets showing all valve parts and descriptions of materials of construction with and applicable to USA material specifications, such as AISI, ANSI, ASTM, AWWA, American Society of Automotive Engineers (SAE) or the Copper Development Association (CDA). Identify each valve by tag number to which the catalog data and detail sheets pertain.
- C. Furnish for approval prior to release to manufacture, factory developed production drawings that clearly show in US imperial units, valve dimensions, laying lengths, port sizes, component parts and materials of construction. Provide graphical factory generated computer modeling results for both estimated noise levels in decibels and for cavitation and its' control through the complete stroke of the valve and through all flow rates.
- D. Furnish for approval prior to release to manufacture, shop assembly drawings that clearly show dimensions and orientation of valve actuators as installed on the valves. Provide valve actuator safety verification through the complete stroke specifically noting values for both break torque under maximum differential as well as maximum dynamic torque. Use the ratio of actuator output torque over valve input torque for validation. Valve Manufacturers compliance shall be factory signed and dated.
- E. Furnish for approval prior to release to manufacture, all shop coating and lining.
- F. After manufacture, furnish a digital copy of signed and dated valve manufacturers mil thickness and holiday free coating and lining test reports. Describe test results and repair procedures for each valve. Do not ship valves to project site until the reports have been approved by the Engineer and accepted by the Owner.
- G. Prior to shipping, furnish for approval three signed and dated copies of valve manufacturers factory shop hydrostatic test reports, performance test reports and any other required test reports. Test reports shall show all relevant test parameters of the valve and actuator assembly as tested in the Manufacturer's facility and shall indicate valve orientation, flow rate, and inlet/outlet pressures as a minimum.
- H. Factory export packaging shall be applicable to overseas shipping via surface carrier.

- I. Submit current quality assurance program certificate of compliance.
- J. Tests and inspection data.
- K. Operation and Maintenance Data
- L. Manufacturer's Certificate of Proper Installation: Certificate shall include signed statements of proper installation and field testing by an authorized manufacturer's representative who has observed the final installation of the valve and confirmed proper installation and performance.

1.5 SUBSTITUTION

- A. Where Plunger Valves are shown or specified in project specifications or plans issued by the Owner, no Contractor may substitute any other style of valve that has not been specifically approved by the Owner at least 2 weeks prior to bid.

1.6 QUALITY ASSURANCE

- A. The Manufacturer shall be ISO 9001 Certified.
- B. Shop Inspection:
 - 1. The valve Manufacturer shall provide a six-week advance notice to the Engineer or Owner prior to performing tests and shall allow full access to Owner's representatives for inspection of manufacturing facilities, processes, and any specified testing. The Manufacturer shall perform all testing at the Manufacturer's cost, unless such testing is specifically indicated to be provided by the Owner.
 - 2. The Owner reserves the right to witness all tests performed by the Manufacturer. The costs of an Owner representatives' travel and accommodations will be paid by the Owner, if the Owner elects to witness testing.
 - 3. The valve Manufacturer shall provide a description and plan of the test setup and shall notify the Owner at least 30 days in advance of the time that each factory test will occur. The valve Manufacturer will be responsible for all above described Owner costs for subsequent valve testing should the initial test fail.
- C. Shop Testing: Plunger Valves shall be shop tested prior to shipment in accordance with the following minimum standards:
 - 1. Leakage Test: Plunger Valves shall be qualitatively tested to 1.1 times valve pressure rating to identify drip tight closure of valve seat, seal leaks and other problems in the assembly process in both flow directions.
 - 2. Hydrostatic Test: Plunger Valves shall be hydrostatically tested to withstand 1.5 times of the valve's maximum design operating pressure rating to identify drip tight body enclosure.
 - 3. A Functional Test: Plunger valves shall be tested for proper functionality. The test procedure shall consist of three (3) complete open/close cycles of operation with the valve actuator settings in place (limit switches, torque switches, position switches, etc.).

4. The valve Manufacturer shall submit six copies of certified shop test reports that shall include all appropriate information including: hand wheel rotation direction, valve full stroke calibration data, pressure settings, operating times and visual inspection notes.

1.7 EXPERIENCE

- A. The valve manufacturer shall have a minimum of ten (10) years of experience in the production and sales of plunger valves. The valve Manufacturer shall also have at least twenty (20) installed Plunger Valve references in that have been in operation in last five (5) years. Valve manufacturer shall provide complete documentation to meet this requirement, including contact names and telephone and fax numbers that can verify field installations. Acceptance of the validity of submitted documentation is solely at the discretion of the client.
- B. The valve manufacturer shall provide 24 hour manufacturers response for any field service requirement. Approved service agents, Licensee(s), or representatives of the manufacturer shall be permitted as long as the valve manufacturer is present. The valve manufacturer shall be responsible for its authorized agents and licensees. A detailed manufacturers signed service call write up, inclusive of photo-documentation, shall be provided without exception, by the valve manufacturer. The valve manufacturer shall be required to know and keep data files on all work performed, modifications and remediations as well as the agents performing the work. This data shall be permanently kept with the manufacturer regardless of licensee.

PART 2 - PRODUCTS

2.1 PLUNGER VALVE PERFORMANCE REQUIREMENTS

- A. Performance: The Plunger Valve shall be designed to operate smoothly throughout the specified flow range without damaging cavitation, excessive noise, or excessive vibration. It shall not need vanes to prevent cavitation.
- B. Noise: Operating noise levels shall not exceed 95 decibels (dBA) at a distance of three (3) feet from the valve at the normal flow point. Material stresses shall not exceed 1/5 of the ultimate or 1/3 of the yield strength of the material. Flow rate as a function of pressure drop across the valve shall be linear to within 3-8%.
- C. The Plunger Valves must be capable of meeting the following liquid performance characteristics for potable water per valve for each operating condition: See table 1 below. See drawing for centerline elevation of each valve.

Table 1											
Location	Plunger		Minimum Flow Rate Condition			Normal Flow Rate Condition			Maximum Flow Rate Condition		
	Tag No.	Size (in)	UP (psi)	DP (psi)	Flow (gpm)	UP (psi)	DP (psi)	Flow (gpm)	UP (psi)	DP (psi)	Flow (gpm)
Tank Turnout (DC)	1150-PV-01	12	10	2	100	9	8	300	8	7	1050
Blue Bench (ED)	3600-PV-01	8	67	35	150	57	50	300	53	48	600
Road Shed (ED)	3800-PV-01	12	46	18	200	33	20	330	25	22	900
Road Shed (JWID)	3800-PV-02	8	46	18	225	33	20	550	25	21	1200
Road Shed (DC)	3800-PV-03	8	46	18	100	33	20	400	25	22	750

USP - Upstream Pressure
 DSP - Downstream Pressure
 DC - Duchesne City
 ED - East Duchesne Culinary Water Improvement District
 JWID - Johnson Water Improvement District

2.2 PLUNGER VALVE OPERATING REQUIREMENTS

- A. Valve Assembly Components: Each Plunger Valve assembly shall consist of a flanged short conical inlet section having an internal cone to divert the water flow into the annular cross sectional area of the valve body.
- B. An oval body section with an inner annular chamber shall be formed by the body shell. The plunger, with custom designed cylinder control trim, shall be an integral part of the internal crank-slider gearbox mechanism and shall be driven by a 90 degree AWWA worm gear. The gearbox shall grant a slower closing speed near the "closed" position enabling extremely soft closing and eliminates the risk of pressure surges. The control trim cylinder shall be field removable and replaceable with alternate control trim when hydraulic conditions change or new operating parameters are required.
- C. The plunger shall move in an axial flow direction to increase or decrease the annular cross section open to the flow medium. The medium will flow around the plunger or when present, through the customized trim, from the outer annular chamber to the inner chamber to control and regulate pressure or flow.
- D. The seals of the plunger valve shall allow the valve to be drip and bubble tight in both flow directions for the long term and without the need for premature seal replacement. The outside of the plunger shall seat against a sealing ring. The ring shall deflect and seal in both axial directions. The ring will provide the best available design for both modulating and for

open close service in the prevention of twist, roll and point loading of the plunger seal. The plunger seal shall be located safely in the hydraulic 'non-critical' pressure zone to avoid any potential hydraulic damage. The seal shall be insensitive to debris. The elastomeric profile sealing ring shall seat leak tight at the downstream end of the plunger. The elastomeric profile sealing ring shall be mechanically retained in the downstream flange of the valve body by a stainless steel seat ring. Valve shaft seals shall prevent the long term potential of water entering into the gear case. The valve operating shaft shall have five o-ring seals; two on the shaft at the crank mechanism and three on the shaft at the gear box. The o-ring seals shall maintain a drip tight seal regardless of modulation cycles or inactivity. The o-ring seals will prevent corrosion of the shaft body bore.

- E. To prevent possible dislodging over the valves life and or during prolonged modulation or transmitted pipeline vibration, the push rod linkages shall be mechanically retained. In addition, the control linkage and complete crank mechanism shall be either completely machined or investment casted. Exposed rough casting which could hide defects are not allowed.
- F. Valves shall be provided with 4 integral feet per each 180 degree circumference. There shall be 4 total lifting lugs, one per each foot. The four lifting lugs shall be factory drilled and taped. They shall be sufficiently broad in placement to assist with rigging of an unbalanced load.
- G. The valve shall function properly and without issue within any 180 degree flange rotation and the actuator with a left or right installation orientation.

2.3 PLUNGER VALVE DESIGN FEATURES

- A. Plunger Valve must be a one or two piece body designed to avoid flow disturbance, corrosion between uncoated body sections and possible leakage. The Plunger Valve shall feature a continuously increasing annular cross section and resulting linear increase of flow velocity to the full open position without producing cavitation.
- B. Plunger Valve design shall feature a customized designed plunger with tailored anti-cavitation trim with slots or orifice holes, or ring, to eliminate all cavitation damage. The area open to flow on the plunger, slots or orifice holes, shall not be open to flow when the valve is placed in the closed position. When required by project conditions, other options include the Vaned Ring for lower pressure differentials and the seat ring for free discharge applications. The plunger shall be seated against the upstream ring and an elastomeric seat located in body downstream flange with the valve in the closed position. The elastomeric seat shall be properly kept in position in a groove in the body and the downstream stainless steel seat ring shall secure the elastomeric profile sealing ring from displacement. The profile seat ring shall not be penetrated by fasteners, exposed to the flow stream in the open position and shall not be subject to cold flow of the elastomer.
- C. The Plunger Valve assembly shall axially recess in the upstream direction and flow water through the slots, ring or orifice holes.
- D. Plunger Valve design shall feature axial stroke movements, upstream and downstream, guided in the internal body by a rugged crank and push rod mechanism of stainless steel. The crank and push rod mechanism shall have an industry standard 90° angle of rotation stroke from open to close matching the travel for AWWA waterworks quarter turn valves. The

provided actuator shall include a mechanical stop in the open and closed positions which will prevent attempts of actuator to hyper extend the plunger or place undesired stresses on the internal linkage system. The plunger shall slide and be contained in the axial position by guide rails. Guide rails shall be affixed to the valve body by method of weldment, rivet, or bolt. The guide rails shall be bronze and shall be positioned around the plunger in an uneven quantity to reduce the potential for damaging harmonic vibration, clogging or excessive wear. The guide rails shall be low to no lead and very low zinc content to prevent dezincification (see Materials of Construction chart).

- E. The movement of the plunger shall be controlled by means of an AWWA electric motor maintenance free irreversible, self-locking, quarter turn, 90 degree AWWA worm gear unit with externally adjustable mechanical stops to limit valve travel in both the open and closed positions. The valve stroke shall equal 90 degrees plus or minus 2 degrees, whereby the mechanical stops of the worm gear shall be engaged before the full extension or retraction of the plunger. In no instance shall the full output torque of actuator be allowed to be transmitted to the valve at its end of travel, either open or closed, without engaging the travel stops of the worm gear first. The AWWA worm gear unit shall be operated by a hand wheel or electric actuator. Only pneumatic or hydraulic cylinder actuators may utilize scotch yoke linkages to change linear piston force to rotational torque. As scotch yoke output torques are inconstant through their complete stroke, the submittals shall mathematically validate the actuator output torques exceed the required valve input torque, inclusive of AWWA safety factors, through the full stroke of the valve.
- F. The design of the annular throat cross section open to flow shall ensure precise flow control over the open to close stroke of the plunger.
- G. The proposed valve actuator shall operate in accordance with the requirements of Section 15201 – Valve and Gate Actuators.
- H. The Plunger Valve must be easy to maintain, as such it shall have the profile sealing ring in the downstream flange or on the downstream portion of the plunger. The seal and ring shall be accessible via a dismantling joint installed downstream of the valve. A mechanic shall not have to reach inside the valve to perform seat replacement. The profile sealing ring shall be interchangeable without dismantling the valve from the pipeline.
- I. Connections: Valve end connections shall be provided by ANSI standard pattern flanges for the size and test pressure rating specified.
- J. The valve body shall come equipped with a threaded tapped plug suitable for draining the valve body cavity should maintenance or inspection be required and/or for installation of a pressure gauge.

2.5 MATERIAL REQUIREMENTS

A. Principal Component Parts Materials of Construction

Item	Size	Material	Specification
Valve Body	All	Ductile Iron	ASTM A536, GR. 60,40,18
Plunger	All	Stainless Steel	AISI 316

Regulating cylinder	All	Stainless Steel	AISI 316
Shaft Bushing		Bronze	ASTM C90800/ CuSn12
Crank shaft	All	Stainless Steel	AISI 431 –solid core, no chrome plating
Crank mechanism	All	Stainless Steel	AISI 431 –solid core, no chrome plating
Seat / Retaining ring	All	Stainless Steel	AISI 316
Plunger guide rails	All	Aluminum	CuAl8 (lead <0.0020%
		Bronze Welded Overlay	Zinc < 0.008%
Quad-sealing-ring	All	EPDM hardness	
Profile sealing ring	All	EPDM (only)	
Shaft O-Rings	All	EPDM	
Gearbox		Housing: Ductile Iron	
		Crank: Stainless cast steel	
		CK3MCuN	

- B. All studs, bolts, washers, and nuts in contact with water shall be Type 316 stainless steel. Seat and seat ring retainers shall be Allen or hex head fasteners. Slotted screw fasteners shall not be used.
- C. All materials of moving components in contact with each other shall be of dissimilar hardness to prevent galling. The valve shall be moved through an open-close-open cycle three (3) times after final assembly and prior to shipment to ensure this requirement.
- D. Use fusion bonded epoxy coating and lining - Submerged Metal, Potable Water. Type: Epoxy per Section 09900 Protective Coatings as well as noted herein.
- E. The valve manufacturer coating process shall include post preparation and coating application assurances of targeted performance. The manufacturer shall utilize and incorporate a QC process that includes Coating thickness Testing, Holiday Free Testing, Cross Linkage Testing, Impact Resistance Testing, Coating Adhesion Testing and Cathodic Disbonding Testing. The Quality Compliance testing shall remain on record with the manufacturer and available for review and approval.
- F. The valve shall be blast coated to near white metal. The blast cleaned body shall be then thoroughly cleaned to remove all dust, grease, oil or other negative adhesion potentials. It shall meet the coating manufacturers recommended duration for humidity and temperature and at coating application. Coating shall take place within 12 hours of the blast cleaning procedure
- H. The applied coating shall be tested and signed and dated-verified holiday free with a dry film thickness of a minimum of 12 mils DFT or as specifically stated in the coatings section.

2.6 FLANGES

- A. For design pressure up to and including 275 pounds per square inch (psi), use AWWA Class E steel flanges or use ANSI B16.5, Class 150 steel flanges.
- B. For design pressures exceeding 275 psi, use ANSI B16.5, Class 300 steel flanges for pipe diameters up to and including 24 inches. Use ASME B16.47, Class 300 steel flanges for pipe diameters 26 through 36 inches.
- C. Facing: Flanges of all classes shall be flat faced; without projection or raised face. Per manufacturer's design, a serrated concentric finish having with at least four (4) grooves (3 grooves/inch) finish shall be used to aid in gasket retention. The cutting tool employed shall have an approximate 0.06 in (1.52 mm) or larger radius. The resultant surface finish shall have a 250 to 500µin. (6.35 to 12.7 µm) roughness.

2.7 PLUNGER VALVE MANUFACTURERS – No Equal

Plunger Valve manufacturer shall be:

- A. VAG Armaturen GmbH
Carl-Reuther-Str. 1
68305 Mannheim, Germany
- B. AV-Tek
Mustafakemalpaşa Organize Sanayi Bölgesi 3.sok. No:3
16500 Mustafakemalpaşa Bursa-Turkey

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Valve installation shall be in strict accordance with the Manufacturer's printed recommendations and the Contract Documents. Uncrated valve handling shall utilize all four lifting eyes.
- B. Four (4) hard bound copies and one (1) CD of the Operations and Maintenance Manual shall be provided with the valve. The manuals shall include installation instructions, maintenance procedures and operation parameters.

3.02 WORKMANSHIP

- A. Valves shall be free from manufacturing defects and shall be manufactured in a workman like manner.
- B. Painting shall be per Section 09900 Protective Coatings. Grease and scale shall be completely cleaned from the valve prior to painting per Society for Protective Coatings (SSPC) standards.
- C. Valves shall be manufactured under the direction of a registered professional engineer.
- D. All carbon steel or ductile iron components shall be painted with a fusion bonded epoxy coating per Section 09900 Protective Coatings. A certificate of compliance with the

purchaser's material specifications and the Manufacturer's quality assurance program shall be furnished with each valve.

3.3 FIELD TESTING AND PERFORMANCE

- A. The valve manufacturer shall furnish all required start-up assistance and inspection of valve after installation at the Owner's facility. Representatives, Licensee(s) and authorized service agents of the valve manufacturer shall not perform any work inclusive of but not limited to, start up and testing, operating the valve without the valve manufacturer's on site presence. The valve manufacturer shall be wholly responsible for any work performed by its Licensee or their authorized agents.
- B. Valves shall be field leak tested by the Contractor to the specified operating pressure in the closed position and shall not leak. Field leakage relevant to the Plunger Valve shall be corrected by the valve Manufacturer at the valve Manufacturer's expense. Field leakage test results shall be certified by the Owner's Engineer or an appointee of the Owner, Manufacturer's onsite representative and Contractor.
- C. Plunger Valves shall be subjected to onsite performance testing as part of the commissioning activities in accordance with a written performance test plan (including a continuous 7-day test). To the extent possible, the valve shall be subjected to variable flow conditions and exposure to the range of typical operating conditions. The flow, upstream and downstream pressures, noise levels, and vibration levels shall be documented and compared to the valve Manufacturer's shop test results.
- D. The plunger valve, electric motor operator shall modulate to maintain either a fixed downstream pressure setpoint or flowrate setpoint as indicated. The command position signal shall be input into the facility PLC and maintained via a PI(D) loop from input data communicated from a downstream pressure transmitter or magnetic flow meter. Start-up will consist of setting each of these loops independently including an appropriate time response for valve movement and inclusive of a deadband, appropriately set for the downstream demand conditions of the system. The complete system shall act as an integrated unit with a continuous feedback loop. The start-up procedures shall include setting this loop control system.
- D. Upon completion of the necessary field testing, the shop test results and field test results comparison shall be discussed expressly with the valve manufacturer. Representatives, Licensee or other stake holders may accompany any discussions but shall not be an acceptable substitute for the valve manufacturer's presence.

3.4 WARRANTY

- A. The plunger valve Manufacturer shall warrant its products, including actuators incorporated in the work, to be free from defects in materials, workmanship and performance for a period of five years from the date of receipt. Upon notice by the Owner, any damage or defect found during the warranty period shall be promptly repaired or replaced by the valve Manufacturer at no cost to the Owner. Where a valve is for sale via a Licensee of the valve manufacturer/ the Licensor, and as this agreement is subject to dissolution and or termination to the potential detriment of the Owner, both the Licensee and the valve Manufacturer, Licensor, shall be wholly responsible for the warranty. The warranty claim and resolution shall be

severable and actionable to both Licensee and Licensor. Warranty claims and resolution will not need to be exhausted through the Licensee and shall remain in effect for the total duration of the warranty period to the Licensor. Performed actions of authorized agents of the Licensee shall constitute actions of the valve manufacturer and shall be the responsibility of the valve Manufacturer/Licensor. This warranty shall be in effect regardless of the contract between the contracted entity/Licensee and the Licensor.

END OF SECTION