AIS Waiver Request
for
Double-Offset Butterfly Valves

General Items

Project Name

Duchesne Valley Water Treatment Plant Process Improvement Project (DVWTP PIP)

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.

Figure 1. Duchesne Valley Water Treatment Plant

The original 4 million gallons per day (MGD) DVWTP was completed in 1980 as a direct-filtration plant. With growth in municipal and industrial demand and increasingly stringent drinking water regulations, it was necessary to upgrade and expand the plant. The expanded plant (8 MGD) was constructed between 2008 and 2010. A pre-ozonation process was featured within the direct-filtration process to meet DBP requirements.

Within a relatively short period of time following completion of the expansion project, the ability of the DVWTP to run at peak capacity was impaired by late fall and early spring algae events in the reservoir that significantly shortened filter run-times and required continual backwashes during the manned hours of plant operation. CUWCD was at a 90-percent design level on a new algae strainer project when fire in the Starvation Reservoir watershed caused a paradigm shift.

The Dollar Ridge Fire of 2018 burned almost 69,000 acres in the Strawberry River watershed upstream of Starvation Reservoir. Three significant thunderstorm events occurred in the weeks following the fire that cause significant to extreme erosion of the burn scar area. Sediment transport and deposition from these events significantly altered the normal water quality regime in the reservoir. The degradation in reservoir water quality required the DVWTP to reduce treatment production rates to deal with the increased turbidity and organic carbon concentrations in the source water while still producing safe drinking water. Discussions with the US Forest Service's Burn Area Emergency Response (BAER) team and a literature search of water treatment facilities below burn scars reported that effects of the fire upon water quality would be significant and could persist for decades. CUWCD staff and its design consultant quickly concluded that the Algae Strainer Project would not achieve the desired treatment

goals in the face of the degraded water quality regime of Starvation Reservoir and discontinued further design work.

Carollo Engineers was selected to provide design and engineering services for the project. With the degradation of source water quality, the direct filtration processes will be inadequate. The purpose of the PIP is to add the processes necessary to convert the DVWTP to conventional treatment with sedimentation and convert from pre-ozonation to intermediate ozonation. Adding the sedimentation process will also require upgrading of the solids handling capabilities of DVWTP.

The project includes modifications to the existing 8 MGD water treatment plant with the following major project elements:

- New enclosed flocculation and sedimentation basins with inclined plate settlers;
- New chemical storage building with new chemical feed systems with chemical addition manifold and flash-mix pumps, new settled water pump station and electrical room;
- Modifications to existing chemical feed systems and ozone static mixers;
- Modification to existing sludge drying beds and construction of two new sludge drying beds;
- New lagoon pump station
- Replacement of existing 300 HP submerged turbine pump with a 400 HP submerged turbine pump and associated electrical gear; and
- Associated modifications to mechanical & yard piping, pumps, valves, meters, chemical feed systems, concrete vaults, structures, electrical, instrumentation, HVAC and site work.

Funding for the project includes a FEMA PDM Grant and loans from EPA's DWSRF program administered by the Utah DDW and from the Utah Community Impact Board. Construction of the project has been bid and awarded to Bodell Construction.

Description of the Foreign and Domestic Construction Materials

The plans and specifications require the installation of new valves for the Project including the use of 27 double-offset butterfly valves ranging in size from 4-inch to 24-inch. The 27 double-offset butterfly valves are constructed of stainless steel, bronze, and ductile iron and must be designed to provide drip tight zero leakage shutoff (to withstand high velocities). Double-offset butterfly valves are produced internationally; there are no domestic manufacturers that can meet the required specifications within the United States.

Unit of Measure

The valves listed above are measured by 'each'.

Quantity

A total of 27 double offset butterfly valves listed in the table below.

Price

AV-TEK Double Offset Butterfly Valves Required			
Size (inch)	Quantity	Unit Price (each)	Total Costs
6	4	[redacted]	[redacted]
8	3		
14	4		
16	4		
18	5		
20	1		
24	6		
Total	**27**		

Time of delivery and availability

Delivery time of the double-offset valves is not applicable to this waiver. However, double-offset 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 double-offset butterfly valves and concluded that there are no domestic manufacturers of these valves that meet the technical specifications of those projects (similar to the DVWTP Process Improvement Project specifications). There are domestic manufacturers capable of providing double-offset butterfly valves in the sizes required for the project but these manufacturers cannot provide valves that meet the 100 percent leak proof requirement and/or a product that meets the AWWA C504 Standard for high velocity design as specified.

Location of the construction project

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

[redacted]

A detailed justification for the use of foreign construction materials

The double-offset butterfly valves, discussed above, are not manufactured domestically in the United States. The purpose of the double-offset butterfly valves in the DVWTP PIP is to provide isolation and shut-off service so that Plant facilities and equipment can be maintained. It is essential that the butterfly valves not leak. These valves are located in below grade confined space manholes and vaults, as well as mechanical, chemical and electrical spaces where leakage may cause hazards to plant staff. The spaces must remain dry since they contain power cables and electronic devices, especially when CUWCD personnel are present and conducting maintenance activities. The double-offset design ensures a 100 percent leak-free valve by preventing the elastomeric seal from being compressed by the disc when the valve is in the open position. The compression set or permanent indentation(s) of the elastomeric seal on single offset or zero offset valves become leak paths. The project's technical

specifications also require that the valves comply with the American Water Works Association C504 Standard, meaning that the valves must allow a maximum velocity of 16 feet per second. In addition, the project's technical specifications require the butterfly valves to have a high velocity elastomeric seal, which is rated to over 300 feet per second, because very high localized velocities could be produced when the valve is being closed. CUWCD, its designer, Carollo Engineers found no domestically manufactured double-offset butterfly valves that meet the project specifications.

These valves are required and specified to isolate portions of the Plant facilities to perform maintenance according to schedules and in times of emergency. The double-offset butterfly valves provide improved performance over other types of valves and withstand leaking pressures. For these reasons, the Central Utah Water Conservancy District has specified double-offset butterfly valves for use on the DVWTP Process Improvement Project.

Availability Waiver Request
Double-Offset Butterfly Valves

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

The double offset butterfly valves are not manufactured domestically in the United States. There are no domestically manufactured replacement valves that would meet the specifications for the DVWTP Process Improvement Project.

For similar projects, the EPA conducted market research on the supply and availability of double offset butterfly valves and concluded that there are no domestic manufacturers of these valves that meet the technical specifications of those projects (similar to the DVWTP Process Improvement Project specifications). There are domestic manufacturers capable of providing double offset butterfly valves in the sizes required for the project but these manufactures cannot provide valves that meet the 100 percent leak proof requirement and/or a product that meets the AWWA C504 Standard for high velocity design as specified.

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's design engineer, Carollo, contacted domestic valve suppliers, seeking to find double-offset butterfly valves that would meet AIS, AWWA C504 and project specifications. A summary of their findings is attached. In addition, CUWCD was recently granted an AIS waiver for double-offset butterfly valves (08-DW-0012, dated 2020/04/28) for the Duchesne Aqueduct Improvement Project. The prime contractor for that project, WW Clyde & Co., contacted domestic suppliers seeking double-offset butterfly valves that would meet AIS, AWWA C504 and project specifications. However, WW Clyde found that there were no domestic suppliers for the double-offset butterfly valves that met the project plans and specifications. WW Clyde's response is also attached.

Project Schedule

See attached

Relevant excerpts from Project Documents

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 [redacted]. The suppliers have stated that the specified valves are not available from a domestic manufacturing source. [redacted]

Sincerely;

Jeff Whinham
Project Manager

C.C Project Files

SECTION 15112

BUTTERFLY VALVES

PART 1 GENERAL

1.01 SUMMARY

A. Section includes: Butterfly valves:
   1. As specified in Section 15110 - Common Work Results for Valves.

1.02 REFERENCES

A. American Society of Mechanical Engineers (ASME):
   1. B16.1 - Cast Iron Pipe Flanges and Flanged Fittings, Classes 25, 125 and 250.
   2. B16.5 - Pipe Flanges and Flanged Fittings, NPS 1/2 through NPS 24.

B. American Water Works Association (AWWA):
   1. C110 - Standard for Ductile-Iron and Gray-Iron Fittings.
   2. C504 - Rubber-Seated Butterfly Valves.
   3. C540 - Standard for Power-Actuating Devices for Valves and Sluice Gates.
   4. C550 - Protective Interior Coatings for Valves & Hydrants.
   5. C606 - Standard for Grooved and Shouldered Joints.

C. ASTM International (ASTM):
   1. A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
   2. A216 - Standard Specification for Steel Castings, Carbon, Suitable for Fusion Welding, for Higher-Temperature Service.
   3. A276 - Standard Specification for Stainless Steel Bars and Shapes.
   4. A351 - Standard Specification for Castings, Austenitic, for Pressure-Containing Parts.
   5. A395 - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures.
   6. A479 - Standard Specification for Stainless Steel Bars and Shapes for Use in Boilers and Other Pressure Vessels.
   7. A515 - Standard Specification for Pressure Vessel Plates, Carbon Steel, for Intermediate - and Higher-Temperature Service.
   8. A516 - Standard Specification for Pressure Vessel Plates, Carbon Steel, for Moderate - and Lower-Temperature Service.
   9. A536 - Standard Specification for Ductile Iron Castings.
   10. A564 - Standard Specification for Hot-Rolled and Cold-Finished Age-Hardening Stainless Steel Bars and Shapes.
   11. A582 - Standard Specification for Free-Machining Stainless Steel Bars.
   12. A743 - Standard Specification for Castings, Iron-Chromium, Iron-Chromium-Nickel, Corrosion Resistant, for General Application.
   13. A890 - Standard Specification for Castings, Iron-Chromium-Nickel-Molybdenum Corrosion-Resistant, Duplex (Austenitic/Ferritic) for General Application.

14. B462 - Standard Specification for Forged or Rolled UNS N06030, UNS N06022, UNS N06035, UNS N06200, UNS N06059, UNS N10362, UNS N06686, UNS N08020, UNS N08024, UNS N08026, UNS N08367, UNS N10276, UNS N10665, UNS N10675, UNS N10629, UNS N08031, UNS N06045, UNS N06025, UNS R20033 Alloy Pipe Flanges, Forged Fittings, and Valves and Parts for Corrosive High-Temperature Service.
15. B584 - Standard Specification for Copper Alloy Sand Castings for General Applications.
16. B691 - Standard Specification for Iron-Nickel-Chromium-Molybdenum Alloys (UNS N08366 and UNS N08367) Rod, Bar, and Wire.
17. D429 - Standard Test Methods for Rubber Property-Adhesion to Rigid Substrate.

D. Compressed Gas Association (CGA):
   1. Standard G-4.1 - Cleaning Equipment for Oxygen Service.

E. NSF International (NSF):
   1. Standard 61 - Drinking Water System Components - Health Effects.

F. United States Code of Federal Regulations (CFR):
   1. 21 - Food and Drugs.

1.03 SYSTEM DESCRIPTION

A. General:
   1. In full compliance with AWWA C504 and following requirements:
      a. Suitable for throttling and isolation operations and infrequent operation after periods of inactivity.
      b. The butterfly valve shall be of the double offset or triple offset design whereby the elastomeric seat is not in compression at any degree of opening except at full closure.
      c. All valves unless noted otherwise, shall be sized for bi-directional water service, full rated pressure and a line velocity of 16 feet per second.
      d. Valves shall be zero leakage with rated 580 pounds per square inch pressure applied in shop tests across closed valve in each direction. Valves shall be zero leakage across closed valve during field test to rated system pressure in each direction.
      e. No travel stops for disc on interior of body.
      f. Isolate metal-to-metal thrust bearing surfaces from flow stream.
      g. Provide traveling nut or worm gear actuator with handwheel. Valve actuators to meet the requirements of AWWA C504.
      h. Buried service operators shall withstand 450 foot-pounds of input torque at fully open and fully closed positions.
      i. Unless otherwise indicated, all manually actuated butterfly valves shall be equipped with a hand wheel and 2-inch square actuating nut and position indicator.

1.04 SUBMITTALS

A. Submit as specified in Section 01330 - Submittal Procedures.

B. Product data: 15110 - Common Work Results for Valves.

1. For general purpose AWWA butterfly valves, include description of the method of attachment of the disc edge to the valve disc.
2. Interior epoxy coatings: Affidavit of compliance attesting that epoxy coatings applied to interior surfaces of butterfly valves comply with all provisions in accordance with AWWA C550.
3. Certification, for valves and coatings in contact with potable water, that the products used are suitable for contact with drinking water in accordance with NSF Standard 61.

C. Commissioning submittals:
1. Provide Manufacturer's Certificate of Installation and Functionality Compliance as specified in Section 01756 - Commissioning.

1.05 WARRANTY

A. Provide warranty as specified in Section 01783 - Warranties and Bonds.

PART 2 PRODUCTS

2.01 GENERAL

A. Valves shall be drip tight in each direction at full system head differential at both test pressure and design pressure.

B. Valves shall have ASME Class 300, Series A (if applicable), raised face flanges, unless noted otherwise.

C. All valves to include operator, actuator, handwheel, chain wheel, extension stem, floor stand, worm and gear operator, operating nut, chain, wrench, and accessories for a complete operation from the intended operating level.

D. Valve shall be suitable for intended service and pressure. Renewable parts not to be of a lower quality than specified.

E. Valve shall be same size as adjoining pipe unless noted otherwise.

F. Valve ends shall fit adjacent piping in all cases. To mate properly with adjacent piping, some valves must have ring joint faced flanges and others must have raised face flanges.

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

H. Valve to open by turning counterclockwise.

I. Factory mount operator, actuator, and accessories.

2.02 MATERIALS

A. Bronze and brass valve components and accessories that have surfaces in contact with water to be alloys containing less than 16 percent zinc and 2 percent aluminum.

1. Approved alloys are of the following ASTM designations: B61, B62, B98/B98M (Alloy UNS No. C65100, C65500, or C66100), B139 (Alloy UNS No. C51000), B584 (Alloy UNS No. C90300 or C94700), B164, B194, and B127.
2. Stainless steel Alloy 18-8 may be substituted for bronze.

B. All valves shall have Type 316 stainless steel bolting throughout the valve. Only the bolting at valve flanges may be carbon steel.

2.03 DOUBLE ECCENTRIC/OFFSET BUTTERFLY VALVES

[redacted]

B. Butterfly Valve Water Works Service 3 Inches to 72 Inches:
1. Design and Operating Requirements:
   a. Valves shall be rated to 367 psi (PN25), with ANSI B16.5 and B16.47, Class ~~300~~150,[AD1] Series A raised face flanges. Each valve shall be drip tight in both directions.
2. Elastomeric Seal:
   a. Valve seats shall be EPDM mounted on the valve disc with Type 316 stainless steel fasteners. It shall be one continuous 360-degree elastomeric ring. It shall not be penetrated by fasteners. The seat shall be field replaceable and adjustable in line. It shall not require special tools or skill sets to replace the seat. Seat removal, replacement and readiness for service must be able to be accomplished in a maximum of 8 hours. Seat methods which do not comply or which use hardened epoxy or grout in a dovetailed groove are not acceptable.
3. Body:
   a. Valve bodies shall be ductile iron ductile iron, ASTM A536 65-45-12 or ASTM A536 60-40-18. Shear stress vulnerable cast iron is not allowed. Valve body shall include a stainless steel stamped or engraved tag indicating manufacturer and reference build data. Valve build data shall be made available upon request by the Owner and shall be retained by the manufacturer for no less than 2 times the expected valve life.
4. Disc:
   a. For valves sizes 3 inches to 20 inches disc shall be ductile iron. For valve sizes 24 inches and larger, disc shall be ductile iron, ASTM A536 65-45-12 or ASTM A536 60-40-18. Disc elastomeric seal retainer shall be Type 316 stainless steel. Disc shall be mechanically fastened to valve shaft using Type 316 (or higher quality alloy) stainless steel tangential shaft pins. Where disc pins extend completely through valve, disc pins shall be mechanically retained or fastened.
5. Shaft:
   a. Shafts shall be stainless steel ASTM A276 Type 316. Valve shaft material shall be suitable for the application, pressure and velocity.
6. Metallic Seat:
   a. The metallic valve seat shall be located in the valve body. It shall be stainless steel alloy. There shall be no gap between the valve body and metallic body seat and consequently no potential for corrosion or lifting of seat. The seat shall be applied through a high alloy weld overlay process.

7. Shaft Seals:
    a. Shaft seals shall not need periodic manual adjustment. They shall be multi-O-ring seals protecting both the outside and inside diameter of the shaft bearings. They shall prevent pressurized system water from entering the uncoated valve disc hub and valve body shaft bore. The valve shaft shall remain nonwetted and unpressurized. The nonwetted shaft shall allow the actuator to be removed without dewatering the pipeline. It shall prevent debris and system pressurized water from entering into the uncoated valve body shaft bore. It shall prevent waters or contaminated media, external to the valve, from entering through the valve shaft under vacuum/negative pressure conditions in the pipeline such as at line break. It shall additionally prevent an ingress breach where external hydrostatic forces exceed pipeline pressures such as in dewatered pipelines. Neither manual pulldown packing glands nor braided packing are allowed. Outer shaft seals shall be replaceable cartridge type, bolted to the valve body and shall not be held in place with an adapter plate or by the valve actuator.
8. Shaft Bearings:
    a. Valve shaft bearings shall be corrosion resistant, self-lubricating sleeve type made of bronze, stainless steel or stainless steel backed PTFE. Bearing choice and consequent bearing friction shall be correctly added to valve input torque requirements.
9. Strength:
    a. The proportion and dimensions of all parts of the valve and actuator shall be designed to withstand, without failure, the stresses occurring under the testing and operating conditions. The maximum allowable stress in any material shall not exceed 1/5 of the ultimate tensile strength or 1/3 of the minimum yield strength.
10. Hardware:
    a. All fasteners and hardware shall be Type 316 stainless steel.
11. Paint and Coatings:
    a. Fusion bond line and coat valves 24 inches and smaller. If coatings are damaged in shipping or installation valve shall be totally recoated in the field.
    b. Line and coat valves larger than 24 Inches with 10 mils of NSF 61 approved 2-part liquid epoxy. All sharp edges to be coated shall be beveled/radiused to assure consistent coating thickness. Include in coating inspection report at least six locations where edges are most sharp for the complete circumference of sharp edge to assure proper coating and compliance. Compliance of proper beveling of all sharp edges with proper coating of carbon steel valves will be strictly enforced as a condition of providing a proper continuous water service valve.

2.04 COATING

A. Shop coat interior and exterior metal surfaces of valves, except as follows:
    1. Interior machined surfaces.
    2. Surfaces of gaskets and elastomeric seats and stem seals.
    3. Bearing surfaces.
    4. Stainless steel surfaces and components.

B. Coating material for potable water applications:
   1. Formulate interior coating material from materials in accordance with CFR 21, AWWA C550, and NSF 61.
   2. Submit affidavit of compliance attesting that epoxy coatings applied to interior surfaces of butterfly valves in accordance with CFR 21, AWWA C550, and NSF 61.

C. Interior surfaces:
   1. Interior surfaces, except for valves used in low-pressure air service: High solids epoxy.
   2. Interior surfaces of valves used in low-pressure air service: High temperature coating for range of 150 to 350 degrees Fahrenheit.

D. Exterior surfaces:
   1. Exterior surfaces of valves, actuators, and accessories coating in accordance with Section 09960 - High-Performance Coatings with the following coating types:
      a. Submerged valves: High solids epoxy.
      b. Buried valves: Coal tar epoxy.
      c. Other valves: High solids epoxy with polyurethane topcoat.
   2. Polished and machined surfaces: Apply rust-preventive compound,
      a. Manufacturers: One of the following or equal:
         1) Houghton, Rust Veto 344.
         2) Rust-Oleum, R-9.

E. Coating materials:
   1. High solids epoxy and coal tar epoxy:
      a. Products: As specified in Section 09960 - High-Performance Coatings:
         1) Coating product in contact with potable water must be in accordance with AWWA C550 and NSF 61.
   2. High temperature coating: As specified in Section 09960 - High-Performance Coatings and in accordance with AWWA C550.
   3. Rust-preventive compound:
      a. Manufacturers: One of the following or equal:
         1) Houghton, Rust Veto 344.
         2) Rust-Oleum, R-9.

F. Field applied coatings of valve exterior:
   1. Match color and be compatible with manufacturer’s coating system and as specified in Section 09960 - High-Performance Coatings.
      a. When shop applied finish coating matches field applied coating on adjacent piping, touch up shop coating in damaged areas in accordance with instructions recommended by the paint manufacturer.
      b. When shop applied coating does not match field coating on adjacent piping, or when damage has occurred to the shop applied coating that requires more than touchup, blast clean valve surfaces or utilize other surface preparation recommended by the manufacturer of the coating material and apply the coating system used for coating adjacent piping.

PART 3 EXECUTION

3.01 INSTALLATION

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

B. Valve Installation and Orientation:
   1. General:
      a. Install valves so handles operate from fully open to fully closed without encountering obstructions.
      b. Install valves in location for easy access for routine operation and maintenance.
      c. Install valves per manufacturer's recommendations.
   2. Butterfly Valves:
      a. Unless otherwise restricted or shown on Drawings, install valve a minimum of eight diameters downstream of an elbow or branch tee and with shaft in horizontal position.
      b. For vertical elbow or branch tee immediately upstream of the valve, install valve with shaft in vertical position.
      c. For horizontal elbow or branch tee immediately upstream of the valve, install valve with shaft in horizontal position.
      d. For free inlet or discharge into basins and tanks, install valve with shaft in vertical position.

C. Extension Stem for Operator: Where the depth of the valve is such that its centerline is more than 3 feet below grade, furnish an operating extension stem with 2-inch operating nut to bring the operating nut to a point 6 inches below the surface of the ground and/or box cover.

D. Install valves with valve shafts horizontal, unless a vertical shaft is required to suit a particular installation, and unless a vertical shaft is indicated on the Drawings.

E. Install pipe spools or valve spacers in locations where butterfly valve disc travel may be impaired by adjacent pipe lining, pipe fittings, valves, or other equipment.

3.02 TESTS AND INSPECTION

A. Each valve shall be tested for leakage both in the factory and on the project site during project startup. Valves which function to isolate flow shall have zero leakage. For each valve, document test pressures upstream and downstream of closed valves and leakage rate, or pressure drop over time. If pressure drop over time is used, testing time to look for pressure drop across each valve shall be 4 hours minimum. Submit test pressures and leakage records.

B. Test that valves open and close smoothly under operating pressure conditions. Test that two-way valves open and close smoothly under operating pressure conditions from both directions.

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

D. Automatic valves to be tested in conjunction with control system testing. Set all opening and closing speeds, limit switches, as required or recommended by the Construction Manager.

E. Test, calibrate, and adjust all limit switches.

3.03 COMMISSIONING

A. As specified in Section 01756 - Commissioning and this Section.

B. Manufacturer services:
   1. Provide certificates:
      a. Manufacturer's Certificate of Installation and Functionality Compliance.

C. Functional testing:
   1. Valves:
      a. Test witnessing: Witnessed.
      b. Conduct pressure and leak test, as specified in Section 15110 - Common Work Results for Valves.

END OF SECTION

[AD1] Addendum No. 1, February 11, 2020.