CENTRAL UTAH WATER
CONSERVANCY DISTRICT

December 21, 2020

Michael Grange
Utah Division of Drinking Water
P.O. Box 144830
SLC, UT 84144-4830

Re: DVWTP PIP New AIS Waiver Request for Stainless Steel Back-Up Rings

Dear Michael:

Please find attached our request for an AIS waiver for Stainless-Steel Back-Up Rings. If the request is in order, please forward to EPA for consideration and approval.

These stainless-steel back-up rings are required at the transition connections between the HDPE yard piping and the steel and ductile iron piping that extends out of the buildings and vaults. These transition connections are to be buried, thus stainless-steel backup rings and bolt packs are required due to the corrosivity of the soil at the project site. Our contractor has contacted a number of HDPE pipe suppliers about whether they are able to furnish stainless-steel back-up rings with their pipe. Each has indicated that there is no domestic source for the back-up rings. We have checked on EPA's AIS Waiver site and find that three projects in the past five years have received waivers for back-up rings. We are also aware that Central Valley Water Reclamation Facility's Biological Nutrient Removal Project has submitted a waiver request for Convoluted Stainless-steel Back-Up Rings in the past month.

We are hopeful that this waiver request will receive approval. Please let me know if additional information is needed to submit this request.

Sincerely;

Cort Lambson, P.E.
Engineering Manager
CUWCD
cort@cuwcd.com
801.376.9180

Enclosures

This waiver request was submitted to the EPA by the state of Utah. All supporting correspondence and/or documentation from contractors, suppliers or manufacturers included as a part of this waiver request was done so by the recipient to provide an appropriate level of detail and context for the submission. There may be documents with project diagrams, schedules, and supplier correspondence in formats that do not meet the Federal accessibility requirements for publication on the Agency's website. Hence, these exhibits have been omitted from this waiver publication. They are available upon request by emailing DWSRFWaiver@epa.gov.

AIS Waiver Request
for
Stainless Steel Back-up Rings

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 stainless-steel back-up or backer rings at transition connections between HDPE and steel or ductile iron piping. Stainless-steel rings for buried applications are required to due to the corrosive nature of the soils on-site. Where feasible, HDPE piping is specified for the yard piping to reduce costs, with transition connections to steel or ductile piping at vaults and buildings. HDPE is typically subject to twisting or torsional forces during installation due to thermal expansion and contraction while in open trenches. To mitigate these forces, HDPE connections to steel or ductile pipe use a solid HDPE adapter flange (no bolt holes) mated to a typical bolted steel or ductile flange with a gasket. A back-up or backer ring (see Figure 2) is installed on the HDPE pipe prior to fusing of the adapter flange on the end of the HDPE pipe. Bolts installed between the back-up ring and the flange on the steel or ductile pipe provide the compression necessary for a leak-proof seal. The project specifications require that the rings be type 304 or 316 stainless steel rated equal to or greater than the pressure rating of the mating pipe; also that the back-up ring bore be chamfered or radiused to provide clearance to the fusion weld radius of the flange adapter. The back-up rings are to be designed for use in HDPE pipe systems and be warrantied for a minimum one-year period. The project requires 85 stainless-steel back-up rings ranging in size from 2-inch to 24-inch. The size and number are tabulated below. The stainless-steel back-up rings are fabricated internationally; there are no domestic manufacturers that can meet the required specifications within the United States.

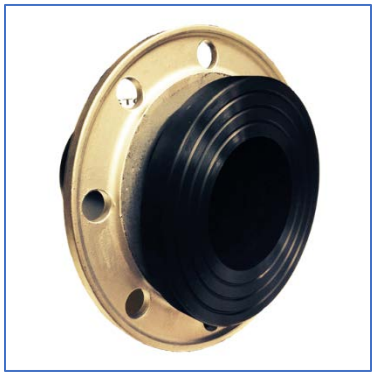

Figure 2. Stainless Steel Back-up Ring on HDPE Adapter Flange

Unit of Measure

The Back-up Rings sizes listed below are measured by 'each'.

Quantity

A total of 85 Stainless Steel Back-up Rings are listed in the table below.

IPP Deltaflex® Back-up Rings			
Size (inch)	Quantity	Unit Cost ($)	Extended Cost ($)
2	13	[redacted]	[redacted]
4	11	[redacted]	[redacted]
6	29	[redacted]	[redacted]
8	2	[redacted]	[redacted]
10	9	[redacted]	[redacted]
12	9	[redacted]	[redacted]
16	2	[redacted]	[redacted]
18	2	[redacted]	[redacted]
20	1	[redacted]	[redacted]
24	7	[redacted]	[redacted]
Total	**85**		[redacted]

*Estimated

Price

We have received price information from the Contractor as shown above, however we are not basing this waiver request on cost, but on availability.

Time of delivery and availability

Delivery time of the stainless-steel back-up rings is not applicable to this waiver. However, stainless steel back-up rings 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 stainless-steel back-up rings and concluded that there are no domestic manufacturers of these rings that met the technical specifications of those projects (similar to the DVWTP Process Improvement Project

specifications). Domestic manufacturers can provide rings that are “either a lap-joint, plate or modified slip-on flange that are designed for metallic systems, but they lack engineering, warranty or specifications supporting a 2:1 safety factor or pressure on a HDPE system.”

Location of the construction project

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

Name and address of the proposed supplier

Local Supplier of IPP Deltaflex® Rings:
ISCO
9541 S. Bagley Park Rd
Salt Lake City UT. 85088

A detailed justification for the use of foreign construction materials

The Deltaflex® convoluted stainless-steel back-up ring design was patented by Improved Piping Products (IPP), a Texas-based firm, specifically for use in HDPE piping systems. The profile was designed to fit the standard fusion weld radius of the HDPE adaptor flange. IPP was unsuccessful in finding a domestic fabricator to produce the convoluted Deltaflex® back-up ring. A suitable fabrication facility with capability was found in China.

The purpose of the stainless steel back-up rings is to provide reliable leak-free transition connections between the HDPE yard piping and the steel or ductile piping in the vaults or buildings. The back-up rings must resist corrosion and be rated to match the pressure rating of the mating pipe. These back-up rings must provide reliable, worry-free service because they will all be buried connections. CUWCD, its designer, Carollo Engineers, and its contractor, Bodell Construction, found no domestically manufactured stainless-steel back-up rings that meet the project specifications.

Availability Waiver Request
Stainless Steel Convoluted Back-Up Rings

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

The convoluted stainless-steel back-up rings are not manufactured domestically in the United States. There are no domestically manufactured stainless-steel back-up rings 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 stainless-steel back-up rings and concluded that there are no domestic manufacturers of these rings that meet the technical specifications of those projects (similar to the DVWTP Process Improvement Project specifications). There are domestic manufacturers capable of providing solid or lap-joint rings in the sizes required for the project, but these manufactures cannot provide back-up rings specifically designed for HDPE piping systems and that meet the specifications and warranty requirements of the project

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 contractor, Bodell contacted HDPE pipe suppliers, seeking to find stainless-steel back-up rings that would meet AIS, and project specifications. Each supplier either indicated that they did not know of any domestic sources of AIS compliant Stainless steel back-up rings or referred them to ISCO, who represents IPP's Deltaflex® convoluted Stainless-steel back-up rings, which are non-domestic. A summary of their findings is attached. ISCO forwarded a letter they received from IPP regarding their Deltaflex® convoluted stainless steel back-up rings. The letter states that they are not aware of a domestic competitor that can supply stainless-steel, AIS compliant back-up rings specifically designed for HDPE piping systems. This letter is also attached.

In addition, CUWCD is aware that a nearby wastewater improvement district, Central Valley Water Reclamation Facility recently applied for an AIS waiver for convoluted stainless-steel back-up rings (Deltaflex®) that is currently under EPA review for their Biological Nutrient Removal Project. The prime contractor for that project, Gerber Construction, also contacted a number of domestic suppliers listed in EPA correspondence, seeking AIS compliant stainless-steel back-up rings. In each case, they found that domestic project compliant back-up rings were unavailable. Similar AIS waiver requests have been granted recently for the City of Baltimore's BRWTP project (2020), the Winston-Salem and Forsyth County City/County Utilities Commission's Muddy Creek WTP project (2015) and the Duchesne County Water Conservancy District's Victory Pipeline project (2015).

Project Schedule

See attachment

Relevant excerpts from Project Documents

See attachment

SECTION 15241

HIGH DENSITY POLYETHYLENE PLASTIC (HDPE) PIPE: AWWA C906

PART 1 GENERAL

1.01 SUMMARY

A. Section includes: High Density Polyethylene Pipe (HDPE), and fittings.

1.02 REFERENCES

A. ASTM International (ASTM):
   1. D1238 - Standard Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer.
   2. D1505 - Standard Test Method for Density of Plastics by the Density-Gradient Technique.
   3. D1599 - Standard Test Method for Resistance to Short-Time Hydraulic Pressure of Plastic Pipe, Tubing, and Fittings.
   4. D1603 - Standard Test Method for Carbon Black Content in Olefin Plastics.
   5. D2122 - Standard Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings.
   6. D2290 - Standard Test Method for Apparent Hoop Tensile Strength of Plastic or Reinforced Plastic Pipe by Split Disk Method.
   7. D3261 - Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.
   8. D3350 - Standard Specification for Polyethylene Plastic Pipe and Fittings Material.
   9. F645 - Standard Guide for Selection, Design, and Installation of Thermoplastic Water-Pressure Piping Systems.
   10. F714 - Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter.
   11. F2164 - Standard Practice for Field Leak Testing of Polyethylene (PE) Pressure Piping Systems Using Hydrostatic Pressure.

B. American Water Works Association (AWWA):
   1. C906 - Polyethylene (PE) Pressure Pipe and Fittings, 4-inch through 63-inch, for Water Distribution and Transmission, and all included references.
   2. M 55 - PE Pipe - Design and Installation Manual.

C. Plastic Pipe Institute (PPI):
   1. PE 4710.
   2. PE Handbook of Polyethylene Pipe.

D. NSF International:
   1. NSF/ANSI 61 - Drinking Water System Components.
   2. NSF/ANSI 14 - Plastic Piping System Components and Related Materials.

1.03 ABBREVIATIONS

A. HDPE: High-density polyethylene pipe.

B. ID: Inside diameter of piping or tubing.

C. IPS: Iron pipe size.

D. OD: Outside diameter.

E. SDR: Standard dimension ratio.

1.04 SUBMITTALS

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

B. Shop drawings:
   1. Detailed layout drawings showing alignment of pipes, location of valves, fittings, and appurtenances, types of joints, and connections to pipelines or structures.

C. Product data: As specified in Section 15052 - Common Work Results for General Piping:
   1. Describe materials and installation equipment including fusion machine. Include optimum range of fusion conditions such as fusion temperature, interface pressure, and cooling time Pipe loads and structural calculations.
   2. Installation instructions.

D. Contractor shall submit proposed piping layout drawings prior to ordering materials. Proposed layout drawings shall clearly identify locations of fittings and couplings.

E. Qualifications of installation crew for high-density polyethylene pipe including qualifications of the fusion machine technician. Furnish proof of training in the use of fusion equipment.

1.05 QUALITY ASSURANCE

A. Fusion machine technician qualifications: 3 years' experience in the installation of similar PE piping systems from the same manufacturer.

B. Markings on the pipe shall be in accordance with AWWA C906.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect piping materials from sunlight, scoring, and distortion.

B. Do not allow surface temperatures on pipe and fittings to exceed 120 degrees Fahrenheit.

C. Store and handle PE pipe and fittings as recommended by manufacturer in published instructions.

PART 2 PRODUCTS

2.01 MATERIALS

A. Extruding and molding material: Virgin material containing no scrap, regrind, or rework material except where permitted in the referenced standards.

B. Fittings: Same material as the pipe and of equal or greater pressure rating.

C. Piping and pipe system components shall comply with NSF 61 or NSF 14 if used for drinking water service.

2.02 HDPE PIPING

A. General:
   1. Pipe and fittings: High-density polyethylene.
   2. Dimensions of pipe and fittings: Based on controlled outside diameter in accordance with ASTM F714:
      a. SDR: As given in the Piping Schedule indicated in the Drawings; or, if not given, SDR equals 9.
      b. Pipe Diameter: IPS dimensions as indicated on the Drawings.
   3. Pipe, fittings, and adapters: Furnished by the same manufacturer, or compatible with components in the same system and with components of other systems to which connected.

B. Materials:
   1. Manufacturers: One of the following or equal:
      a. Performance Pipe.
      b. WL Plastics.
      c. ISCO Industries.
      ~~c.~~ d. Infrapipes. AD4
   2. Polyethylene: As listed by the PPI under the designation PE 4710; and have a minimum cell classification, in accordance with ASTM D3350, of 445574C:
      a. Pipe and fittings: Manufactured from material with the same cell classification.
      b. Manufacturer shall certify that pipe and fittings meet the above classifications.
   3. Polyethylene fittings and custom fabrications:
      a. Molded or fabricated.
      b. Butt fusion outlets shall be made to the same outside diameter, wall thickness, and tolerances as the mating pipe.
      c. All fittings and custom fabrications shall be fully rated for the same internal pressure as the mating pipe.
      d. Pressure de-rated fabricated fittings shall not be rated for less than the test pressure indicated in the Pipe Schedule.
   4. Molded fittings:
      a. Manufactured in accordance with ASTM D3261, Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing and shall be so marked.
      b. Each production lot of molded fittings shall be subjected to the tests required under ASTM D3261.

5. X-ray inspection: The Manufacturer shall submit samples from each molded fittings production lot to x-ray inspection for voids, and shall certify that voids were not found.
6. Fabricated fittings:
    a. Made by heat fusion joining specially machined shapes cut from pipe, polyethylene sheet stock, or molded fittings.
    b. Rated for internal pressure service at least equal to the full service pressure rating of the mating pipe.
7. Polyethylene flange adapters:
    a. Flange adapters shall be made with sufficient through-bore length to be clamped in a butt fusion joining machine without the use of a stub-end holder.
    b. The sealing surface of the flange adapter shall be machined with a series of small v-shaped grooves to provide gasketless sealing, or to restrain the gasket against blowout.
8. Flange gaskets:
    a. Gaskets for HDPE to HDPE flange connections are not required unless required by the flange manufacturer to satisfy the test pressure given in the pipe schedule.
9. Back-up rings and flange bolts:
    a. Flange adapters shall be fitted with Type 304 or 316 stainless steel back-up rings pressure rated equal to or greater than the mating pipe.
    b. The back-up ring bore shall be chamfered or radiused to provide clearance to the flange adapter radius.
    c. Flange bolts and nuts shall be the same material as backing flange and as specified in Section 15052 - Common Work Results for General Piping.

2.03 SOURCE QUALITY CONTROL

A. HDPE piping:
    1. Manufacturer's quality control: The pipe and fitting manufacturer shall have an established quality control program responsible for inspecting incoming and outgoing materials.
    2. Incoming polyethylene materials:
        a. Inspected for density, melt flow rate, and contamination.
        b. The cell classification properties of the material shall be certified by the supplier and verified by manufacturer's quality control.
        c. Approved by quality control before processing into finished goods.
    3. Outgoing materials shall be checked for:
        a. Outside diameter, wall thickness, and eccentricity in accordance with ASTM D2122 at a frequency of at least once per hour.
        b. Out of roundness at a frequency of at least once per hour.
        c. Straightness, inside and outside surface finish, markings and end cuts shall be visually inspected in accordance with ASTM F714 on every length of pipe:
            1) Quality control shall verify production checks and test for:
                a) Density in accordance with ASTM D1505 at a frequency of at least once per extrusion lot.
                b) Melt Index in accordance with ASTM D1238 at a frequency of at least once per extrusion lot.
                c) Carbon content in accordance with ASTM D1603 at a frequency of at least once per day in accordance with extrusion line.

d) Quick burst pressure in accordance with ASTM D1599 at a frequency of at least once per day per line.
e) Ring Tensile Strength in accordance with ASTM D2290 at a frequency of at least once per day per line.

d. X-ray inspection shall be used to inspect molded fittings for voids, and knit line strength shall be tested. All fabricated fittings shall be inspected for joint quality and alignment.

4. Permanent records: The manufacturer shall maintain permanent QC and QA records.
5. Compliance tests:
   a. Manufacturer's inspection and testing of the materials.
      1) In case of conflict with manufacturer's certifications, the Contractor, Engineer, or Owner may request retesting by the manufacturer or have retests performed by an outside testing service.
      2) All retesting shall be at the requestor's expense, and shall be performed in accordance with this Section.

PART 3 EXECUTION

3.01 INSTALLATION

A. General:
   1. Where not otherwise specified, install piping in accordance with ASTM F645, or manufacturer's published instructions for installation of piping, as applicable to the particular type of piping.
   2. Provide molded transition fittings for transitions from HDPE to metal or IPS pipe. Do not thread or solvent weld HDPE pipe.

B. Installation of HDPE piping:
   1. Joining:
      a. Heat fusion joining:
         1) Joints between plain end pipes and fittings shall be made by butt fusion, and joints between the main and saddle branch fittings shall be made utilizing saddle fusion employing only procedures that are recommended by the pipe and fitting manufacturer.
         2) The Contractor shall certify, in writing, that persons making heat fusion joints have received training in the manufacturer's recommended procedure and have had at least 3 years current experience in the heat fusion butt welding process.
         3) The Contractor shall maintain records of trained personnel, and shall certify that training was received not more than 12 months before commencing construction.
         4) External and internal beads shall not be removed.
      b. Heat fusion training services: The manufacturer shall provide training in the manufacturer's recommended butt fusion and saddle fusion procedures to the Contractor's installation personnel, and to the inspector(s) representing the Owner, prior to the start of construction.
      c. Mechanical joining:
         1) Polyethylene pipe and fittings may be joined together or to other materials by means of flanged connections (flange adapters and back-up rings) or, where specifically indicated on the Drawings,

flexible couplings designed for joining polyethylene pipe or for joining polyethylene pipe to another material.

2) Flexible couplings shall be fully pressure rated and fully thrust restrained such that when installed in accordance with manufacturer's recommendations, a longitudinal load applied to the mechanical coupling will cause the pipe to yield before the mechanical coupling disjoins.

2. Installation:
   a. General:
      1) The Manufacturer shall package products for shipment in a manner suitable for safe transport by commercial carrier.
      2) When delivered, a receiving inspection shall be performed, and any shipping damage shall be reported to the Manufacturer within 7 days.
      3) Damaged pipe shall be promptly removed from the job site.
      4) Installation shall be in accordance with Manufacturer's recommendations, and this specification.
      5) Prior to making a terminal connection to subsurface structures or piping, the temperature of each individual run of HDPE shall be allowed to approach the service temperature at which the pipe is intended to operate. Backfill materials may be placed around the pipe and up to 6-inches above the pipe to facilitate cooling:
         a) Any damage that occurs to subsurface structures or piping as a result of thermal expansion and contraction of the installed piping shall be repaired by the Contractor using a method acceptable to the Engineer at no additional cost to the Owner.
      6) All necessary precautions shall be taken to ensure a safe working environment in accordance with applicable codes and standards.
   b. Large diameter fabricated fittings: Fabricated fittings shall be butt fused to the end of a pipe.
   c. Mechanical joint and flange installation:
      1) Mechanical joints and flange connections shall be installed in accordance with the manufacturer's recommended procedure.
      2) Flange faces shall be centered and aligned to each other before assembling and tightening bolts.
      3) Every effort shall be made to ensure that the opposing faces of the flange assemblies mate up securely at a temperature approximately the same as the service temperature.
      4) In no case shall the flange bolts be used to draw the flanges into alignment.
      5) Bolt threads shall be lubricated, and flat washers shall be fitted under the flange nuts.
      6) Bolts shall be evenly tightened according to the tightening pattern and torque step recommendations of the manufacturer.
      7) At least 1 hour after initial assembly, flange connections shall be re-tightened following the tightening pattern and torque step recommendations of the manufacturer.
      8) The final tightening torque shall be 100 feet-pounds or less as recommended by the manufacturer.
   d. Pipe handling:
      1) Lift, move, or lower pipe and fittings only with wide fabric choker slings.
      2) Wire rope or chain shall not be used.

3) Slings shall be of sufficient capacity for the load and shall be inspected before use.
4) Worn or defective equipment shall not be used.

e. Excavation, backfill material and backfilling and compacting:
1) As specified in Specification 02318 - Trenching.

3.02 FIELD QUALITY CONTROL

A. Testing:
1. Butt fusion testing:
a. The first fusion of each day shall be a trial fusion.
1) The trial fusion shall be allowed to cool completely.
2) Fusion test straps shall be cut out.
a) The test strap shall be 12 inches (minimum) or 30 times the wall thickness in length with the fusion in the center, and 1 inch (minimum) or 1.5 times the wall thickness in width.
3) Bend the test strap until the ends of the strap touch.
b. If the fusion fails at the joint, a new trial fusion shall be made, cooled completely and tested.
c. Butt fusion of pipe to be installed shall not commence until a trial fusion has passed the bent strap test.

B. Data logging and test data:
1. A data logger shall be installed on the fusion heated joining machine. Data on each joint shall be recorded by the data logger. Data to be recorded shall be minimum temperature of joint fusion and interface pressure of the fused joint.
2. Recorded data from the fusion data logger shall be transmitted to the Owner daily.

C. Pressure testing:
1. Conduct as per ASTM F2164 in accordance with AWWA M 55 Chapter 9.
2. Test pressures as specified in the Pipe Schedule.
3. Temperature of test water shall be no more than 73 degrees Fahrenheit due to sensitivity of pipe pressure rating to temperature.

END OF SECTION

[AD4] Addendum No. 4, February 26, 2020.