

SPECIFICATION for ISCO HDPE DUAL CONTAINMENT PIPE

SECTION 15000 MECHANICAL

1. GENERAL

- 1.1 This specification shall govern the materials and installation of polyethylene dual contained system of pipe, structures and leak detection. Installation shall be performed in accordance with this specification. The general contractor shall be responsible for the installation and operation of the piping system. No deviation from this specification shall be allowed without express written consent of the engineer.
- 1.2 Reference of standards and certifications
- 1.2.1 For the Piping System
- AWWA C 901 - Polyethylene Pressure Pipe, Tubing and Fittings, 1/2" through 3" for Water
 - AWWA C 906 - Polyethylene (PE) Pressure Pipe and Fittings, 4" through 63", For Water Distribution
 - ASTM F 714 - Polyethylene Plastic Pipe Based on Outside Diameter (3" to 63")
 - NSF Std #14 - Plastic Piping Components & Related Materials
 - ASTM C 1147 - Practice For Determining Short Term Tensile Weld Strength of Chemical Resistance
 - ASTM D 638 – Standard Test Method for Tensile Properties of Plastics
 - ASTM D 790 – Standard Test Method for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
 - ASTM D 1238 – Standard Test Method for Flow Rates of Thermal Plastics by Extrusion Plastometer
 - ASTM D 1505 – Standard Test Method for Density of Plastics by the Density-Gradient Technique
 - ASTM D 1599 – Standard Test Method for Resistance to Short-Time Hydraulic Failure Pressure of Plastic Pipe, Tubing and Fittings
 - ASTM D 1693 – Standard Test Method for Environmental Stress Cracking of Ethylene Plastics
 - ASTM D 2122 – Standard Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings
 - ASTM D 2513 – Standard Specification For Polyethylene(PE) Gas Pressure Pipe, Tubing, and Fittings
 - ASTM D 2837 - Method for obtaining Hydrostatic Design Basis for Thermal Plastic Pipe Materials

- ASTM D 3035 – Standard Specification for Polyethylene(PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter
- ASTM D 3350 – Standard Specification for Polyethylene Plastics Pipe and Fittings Material
- ASTM D 4218 - Standard Test Method for Determination of Carbon Black Content in Polyethylene Compounds By the Muffle-Furnace
- ASTM F 1473 - Standard Test Method for Notch Tensile Test to Measure the Resistance to Slow Crack Growth of Polyethylene Pipes and Resins
- ASTM F 2164 – Standard Practice for Field Leak Testing of Polyethylene (PE) Pressure Piping Systems Using Hydrostatic Pressure
- ASTM F 2620 – Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings

- 1.3 Experience of manufacturer not shall be less than 10 years of manufacturing and production of dual contained piping and related fittings.
- 1.4 The dual containment piping system shall be ISCO Dual Contained Pipe from ISCO Industries, LLC (1-800-345-4726), or equal.

2. SCOPE OF WORK - This specification shall be for:

- 2.1 The purchase of prefabricated high density polyethylene dual contained pipe, and fittings designed for simultaneous butt fusion welding.
- 2.2 Training and/or field fusion of the dual containment piping system and testing of the dual containment piping system after installation.
- 2.3 The pipe system application's requirements are: a carrier pipe pressure requirement of ____psi, a flow rate of ____ (per pipe size), a maximum burial depth of ____ ft, with a water table of ____ft. The temperature range of operation will be ____°F low to a high of ____°F. The minimum low temperature will be ____°F and the maximum high temperature will be ____°F.

3. MATERIALS

- 3.1 **PIPE AND FITTINGS** - The pipe used to fabricate the system supplied under this specification shall be high density, extra high molecular weight polyethylene pipe. The pipe and fittings shall conform to ASTM D-3350 with minimum cell classification values of 345464C.
- 3.2 **PHYSICAL PROPERTIES OF PIPE COMPOUND**
 - 3.2.1 **Density** - the density shall be no less than 0.955 gms/10 min as referenced in ASTM D1505.
 - 3.2.2 **Melt Index** -the melt index shall be .05-0.11 gms/10 minutes when tested in accordance with ASTM D 1238.

- 3.2.3 Flex Modulus - flexural modulus shall be 110,000-140,000 psi as referenced in ASTM D 790.
 - 3.2.4 Tensile Strength at yield - tensile strength shall be at least 3,200 psi as referenced in ASTM D 638.
 - 3.2.5 Hydrostatic Design Basis shall be 1,600 psi at 23 degrees C when tested in accordance with ASTM D 2837.
 - 3.2.6 Tested according to ASTM F 1693, ring specimen ESCR is zero failures in more than 5,000 hours.
 - 3.2.6 Slow Crack Growth Resistance shall be per ASTM F 1473 (PENT Test). The results shall be greater than 100 hours.
 - 3.2.7 Chemical resistance data from the pipe manufacturer on the application will be provided as part of the submittal. The engineer may require a certification letter from the manufacturer as part of the submittal.
- 3.3 Deviations - If a contractor chooses to submit a bid that does not meet all of the requirements of this specification, the bid shall include a written description of the deviations with data that show the magnitude of the deviations and the justification for the deviation from the specification. The decision to accept material deviating from this specification shall be the responsibility of the specifying engineer and must be approved in writing.
- 3.4 Dual contained pipe and fittings may be rejected for failure to meet any of the requirements of this specification.

4. DUAL CONTAINMENT PIPING SYSTEM

- 4.1 The dual containment piping system shall be ISCO Dual Contained pipe and fittings as manufactured by ISCO Industries, LLC., or equal.
 - 4.1.1 Pipe supplied under this specification shall have IPS (Iron Pipe Size) OD and shall meet ASTM D 3035. Pipe sizes shall be as specified in the following table. The dual containment combination, inner by outer pipe, the ID and OD of the carrier and containment, and the SDRs shall be as specified herein.

Pipe Size	Carrier ID	Carrier OD	Carrier SDR	Cont ID	Cont OD	Cont SDR

- 4.1.2 Fittings shall be manufactured with the same OD as carrier and containment pipe and have minimum pressure rating for carrier equal to the carrier pipe. Deviations must be approved by the engineer.
 - 4.1.2.1 - All fittings shall meet the pressure requirements of the system as specified and based on ASTM D 2837 Hydrostatic Design Basis for Thermoplastic Pipes.

4.1.2.2 - All molded fittings shall be manufactured per ASTM D3261.

4.1.2.3 - Pipe joints and fittings shall be supplied to the job site ready for simultaneous butt-fusion. The fabricator shall show that the materials are capable of butt-fusion and shall provide a procedure to consistently produce sound welds.

4.2 Carrier pipe support shall be with full round centralizers welded to the carrier pipe. Centralizer support spacing per Plastic Piping Institute standards and ISCO Industries, LLC best practice shall be _____ inches per *each pipe size*.

4.2.1 The centralizers will be either molded or machined from HDPE Pipe Grade resins or sheet. Manual or hand cut centralizers are not permitted since they have a low degree of dimensional accuracy. Centralizers should have at least two openings that will permit the flow of liquid between the carrier pipe and the containment pipe. The centralizer shall be thermally bonded to the primary carrier pipe, and maintain position and alignment of the primary carrier in relation to the secondary containment piping. Each end of pipe will have a centralizer that is thermally bonded to both the OD of the primary carrier and the ID of the secondary containment piping and designed such that movement will be restrained between the two piping systems during the butt fusion process.

4.2.2 The OD of the centralizer shall match the ID of the containment piping as closely as possible.

4.3 End termination fittings shall be used to seal the system at both ends. The fitting shall be simultaneously butt fused to the carrier and containment pipe to seal the annular space. Terminations that are not butt fused in the system will not be allowed. This fitting will also provide the transition to single wall piping.

4.4 Tie-ins to other piping systems and/or equipment where butt-fusion is not applicable shall be with HDPE flange adapters and metal back-up rings, unless otherwise specified by the engineer on the drawings. Mechanical compression or clamp style fittings will not be allowed under this specification.

5. EXECUTION

5.1 Pipe shall be prefabricated prior to shipment to the jobsite. No on-site fabrication to the pipe, fittings or system shall be allowed without express written consent of the engineer and the piping supplier.

5.2 Pipe shall be stored on clean, level, dry ground to prevent undue scratching or gouging of the pipe. The pipe ends shall be capped to prevent water and dirt from contaminating the annular space between the pipes. If the pipe must be stacked for storage, such stacking should be done in accordance with the pipe manufacturer's recommendations. The handling of the pipe should be done in

such a manner that it is not damaged by dragging over sharp objects or cut by chokers or lifting equipment.

- 5.3 Segments of pipe having cuts or gouges in excess of 10% of the wall thickness of the pipe shall be cut out and removed. The undamaged portion of pipe can be rejoined after a new end piece has been welded to the pipe.
- 5.4 Sections of polyethylene pipe shall be joined into continuous lengths on the job site following the guidelines of ASTM F 2620, using simultaneous butt fusion as the method of joining the dual contained polyethylene piping system.
 - 5.4.1 System supplier shall approve all fusion equipment used for the containment system. The butt fusion equipment used to join the pipe shall be capable of meeting all normal butt fusion requirements: alignment, heating, trimming and fusion pressure.
 - 5.4.2 System supplier shall provide written butt fusion pressure procedure as part of the submittal package.
- 5.5 Fused segments of pipe shall be moved to avoid damage to the pipe. Handle dual contained pipe with care. Limit bending of the pipe. Nylon slings are preferred.
- 5.6 A representative of the dual containment pipe fabricator shall be on site to train the contractor's personnel. Only the system supplier or those personnel trained by the system supplier are approved to simultaneous weld dual containment pipe.
- 5.7 Modification to the system will be done only by a representative of the dual containment pipe fabricator or trained installer. This includes changes in lengths of pipe and special tie in connections.
- 5.8 Direct Burial
 - 5.8.1 The trench and trench bottom shall be constructed in accordance with ASTM D 2321-Section 7.
 - 5.8.2 Embedment materials shall be Class I, Class II or Class III materials as defined by ASTM D 2321- Section 6. Class 1 materials are preferred.
 - 5.8.3 Bedding of the pipe shall be performed in accordance with ASTM D 2321- Section 8. Compaction rates shall be _____% Standard Proctor Density in accordance ASTM D 2321.
 - 5.8.4 Haunching and initial backfill shall be as specified in ASTM 2321- Section 9 using Class I materials. Materials used and compaction rates shall be specified by the engineer on the drawings.

- 5.8.5 Special Conditions, ASTM 2321- Section 11.2, Minimum Cover for Load Applications, Section 11.3, Use of Compaction Equipment and Section 11.4 Removal of Trench Protection shall apply unless directed otherwise by the engineer.
- 5.9 The clean and dry installation of the containment piping's annular space is critical. The pipe installation contractor shall insure that the pipe's annular space is clean and dry.
- 5.10 System Testing
- 5.10.1 For pressure systems, a hydrostatic test of 1.5 times the working pressure rating of the lowest pressure rated component in the system. A pressure test of _____psi will be required for the force main(s). The carrier is recommend to be tested using the same guidelines outlined in ASTM F 2164 using pass/fail criteria from section 9.8. Similar test outlined by HDPE pipe manufacturers and the Plastic Pipe Institute (PPI) are acceptable, including those with make-up water tables. Contractor should submit any carrier hydrostatic test procedure that does not follow ASTM F 2164.
- 5.10.2 The carrier (inside pipe) shall be tested at 20 feet of head or 10 psi air for gravity systems. Air pressure should be allowed to equalize for 10 minutes, then monitor the pipe for the test period of 10 minutes, during which no drop in pressure shall be allowed.
- 5.10.3 The annular space between the carrier and containment pipe shall be tested at 10 psi air pressure. Air pressure should be allowed to equalize for 10 minutes, then monitor the pipe for the test period of 10 minutes, during which no drop in pressure shall be allowed.

6. SUBMITTALS

- 6.1 General - Applicable manufacturer's data is required to demonstrate compliance with this specification. Submit on supplier's experience with these systems.
- 6.2 Pipe and Materials - Submit on cell class according to ASTM D-3350 and applicable standards identified by the cell class.
- 6.3 Dual Containment Piping System - Submit carrier and containment pipe sizes per ASTM F 714 or ASTM D 3035. Submit that any molded fittings in the system that shall meet ASTM D 3261. Submit details of typical fittings including ells, tees, end terminations, etc.
- 6.4 Execution - Submit data on system fusion welding procedure(s) and welding equipment required. Submit handling and storage data. Submit comprehensive system testing guidelines.