

Chapter 8

Specifications



Specifications



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Table 15: HDPE Resin Specifications

Property	Specifications	Unit	Nominal Value
Material Designation	PPI/ASTM		PE3408
Cell Classification	ASTM D 3350-02		345464C
Density (3)	ASTM D - 1505	gm/cm ³	0.955
Melt Index (4)	ASTM D - 1238	gm/10 min.	0.11
Flexural Modus (5)	ASTM D - 790	psi	135,000
Tensile Strength (4)	ASTM D - 638	psi	3,200
Slow Crack Growth			
ESCR	ASTM D - 1693	hours in 100% igepeal	>5,000
PENT (6)	ASTM F 1473	hours	>100
HDB @ 73 deg. F (4)	ASTM D - 2837	psi	1,600
UV Stabilizer (C)	ASTM D - 1603	% C	2.5%

Polyethylene Pipe Liner

1.0 Scope

These specifications cover the purchase of polyethylene plastic pipe liners (PPL) for lining existing culvert pipes. Pipe liner(s) furnished to this specification shall meet or exceed all requirements.

1.1 Notice to Bidders

Bidders are cautioned to read the specifications carefully, as there may be special requirements not commonly offered by the pipe liner manufacturer. Note that pipe liner delivered to the FOB points that do not meet specifications in every aspect will not be accepted.

2.0 Material Requirement

2.1 Pipe liner shall meet the following requirements and conform to the reference specifications:

2.1.1 Reference Specifications:

This specification references American Society for Testing and Materials (ASTM) standard specifications, which are made a part hereof by such reference and shall be the latest edition and revision thereof.

2.1.2 The liner pipe shall be made of high-density polyethylene resins in accordance with the requirements of ASTM D-3350-02. The Cell Classification will be 345464C and shall have the

Plastic pipe Institute designation of PE 3408.

2.1.3 Pipe liner shall be a minimum Dimension Ratio (DR) of 32.5. The installed pipe shall have a smooth non-corrugated interior surface.

2.2 The diameter dimensions of PPL shall be capable of maintaining a minimum flow rate equivalent to 100% of the original in-place culvert and meet the requirement of Table 15, above, of this specification. The length shall be as specified in the plans.

2.3 The PPL shall be capable of being joined into a continuous length by an approved interlocking method. The joints shall not create an increase in the outside diameter of the liner pipe to eliminate coupling hang-ups. The joints must be water-tight with gaskets that are capable of handling pressures in excess of 25 feet of head per ASTM D-3212. The joining system for the liner pipe shall be Snap-Tite® or equal.

2.4 Each PPL shall have a male and a female end.

2.5 Each length of PPL furnished shall be permanently marked by the manufacturer with the manufacturer's name and applicable ASTM designation. The marking shall be such that it will not be removed during handling, shipment or placement.

2.6 Liner Pipe Joints

The liner pipe shall be capable of being joined



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into continuous lengths by an approved method. The joints shall not create an increase in the outside diameter of the liner pipe to eliminate coupling hang ups. The joints must contain a gasket and be water-tite.

The joining shall be Snap-Tite® or equal.

3.0 Order Information

Specific diameter and lengths are to be shown in the order.

4.0 Certification

The supplier shall furnish a manufacturer's certification stating that the material in the pipe meets the requirements of ASTM D 3350-02 with a cell classification of PE 345464C with the physical properties indicated above. The supplier shall certify the dimensions meet the requirements of ASTM F 714 or as indicated in these specifications or drawings.

3.0 Order Information

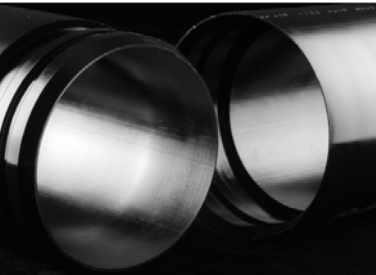
3.1 The inside diameter of the existing pipe to lined are to be shown. The lengths of the PPL are to be specified on the order.

4.0 Construction

4.1 Before inserting the liner, the pipe must be cleaned. All debris or other materials must be removed from the host pipe.

5.0 Grouting

5.1 After the liner is in place, the area between the original pipe and the liner shall be completely filled with grout in such a manner as to obtain a substantially uniform space between the liner and the original pipe; on the top, bottom and sides.



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Sample Specification For Snap-Tite® Culvert Liners

Culvert Liners-Culvert liners shall be **Snap-Tite® Culvert Liners** or equivalent. Culvert liner pipes shall be made of high-density polyethylene resins in accordance with the requirements of ASTM D-3350-02 or later. The cell classification will be 345464C and shall have the Plastic Pipe Institute designation of PE 3408. The liner pipe shall comply with requirements of ASTM F-714 for dimensions and have a maximum DR of 32.5. The liner pipe shall have a smooth, non-corrugated interior and exterior capable of maintaining a minimum flow rate equivalent to 100% of the original in-place culvert. The liner shall be resistant to the effects of ultraviolet rays. Culvert liner shall be installed in accordance with the installation instructions of the manufacturer or as directed by the engineer.

The liner pipe shall be capable of being joined into continuous lengths by an approved method. The joints shall not create an increase in the outside diameter of the liner pipe to eliminate coupling hang-ups. The joints must contain a gasket or sealant and be watertight, capable of handling pressures in excess of 25 feet of head per ASTM D-3212. The joining system for the liner pipe shall be Snap-Tite® or equal.

Existing culverts shall be cleaned of all debris and any sharp edges repaired. Care shall be taken when installing culvert liners in existing pipes with extruding bolts or hardware so as not to score or damage liner. In some cases it may be necessary to place a skid system in the existing culvert to protect the liner from damage during installation. The skid system shall be installed so as to allow the grout to flow completely around the liner.

The complete liner shall be grouted the entire length between the old corrugated pipe and the new liner pipe. The grout shall be foamed with a density of not more than 50 lbs. per cubic foot. The grout shall have a strength of 300 psi.

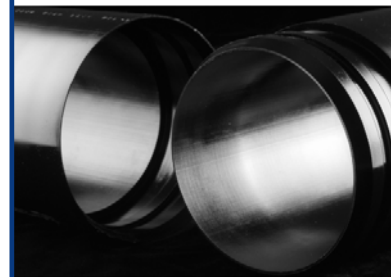
The price paid for pipe liners shall be by the lineal foot and shall include all work performed on existing culverts, i.e.: cleaning out debris, removing sharp edges, installing skid systems so damage is minimal, placing grout and removal of brush and or small trees necessary to accommodate the new pipe liners.

Table 16: Pipe Liner Dimensions

Existing Pipe Size (ID) in.	Liner		
	Clearance OD of the Plastic Liner Pipe Minimum (in.)	Maximum (in.)	Clearance ID Minimum** (in.)
12	1.25	1.25	1.910
15	1.61	2.25	3.034
18	2.00	4.00	4.872
21	2.00	3.00	4.108
24	2.40	4.00	5.230
27	2.70	3.00	4.476
30	3.00	6.00	7.476
33	3.30	5.00	6.724
36	3.60	4.00	5.970
42	4.20	6.00	8.216
46	4.60	4.00	6.584
48	4.00	6.00	8.584
54	5.00	6.00	9.664
60	6.00	6.00	9.324

* Clearance is the difference between the inside diameter (ID) of the existing pipe and the outside diameter (OD) of the (PPL) liner.

** Distance between ID of existing pipe & minimum ID of the liner pipe.



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Specifications for High Density Polyethylene Risers (See Chapter 9 for information on Risers for Spillway rehabilitation.)

1. GENERAL

This specification shall govern the materials and fabrication of high-density polyethylene risers.

2. SCOPE OF WORK

This contract covers the purchase and fabrication of high-density polyethylene risers.

3. MATERIALS

The pipe for the riser shall be made from high-density polyethylene (HDPE) resins meeting the following requirements:

3.1 HDPE MATERIAL SPECIFICATIONS

3.1.1 HDPE MATERIAL - The HDPE material supplied under this specification shall be high density, high molecular weight as supplied by ISCO INDUSTRIES, LLC. Louisville, KY. The HDPE material shall conform to ASTM D-3350-02 with minimum cell classification values of 345464 C. Earlier versions of this specification will not be accepted.

3.1.2 PHYSICAL PROPERTIES OF HDPE COMPOUND

3.1.2.1 Density-the density shall be no less than 0.955 gms/ccm as referenced in ASTM D 1505.

3.1.2.2 Melt Index-the melt index shall be no greater than 0.105 gms/10 minutes when tested in accordance with ASTM D 1238-Condition 190/2.16.

3.1.2.3 Flex Modulus-flexural modulus shall be 110,000 to less than 160,000 psi as referenced in ASTM D 790.

3.1.2.4 Tensile Strength at Yield-tensile strength shall be 3,200 to less than 3500 psi in accordance with ASTM D 638.

3.1.2.5 Slow Crack Growth Resistance shall be per ASTM F 1473 (PENT Test). The results shall be greater than 100 hours.

3.1.2.6 Hydrostatic Design Basis shall be 1,600 psi at 23 degrees C when tested in accordance with ASTM D 2837.

4. Submittal AND QUALITY ASSURANCE

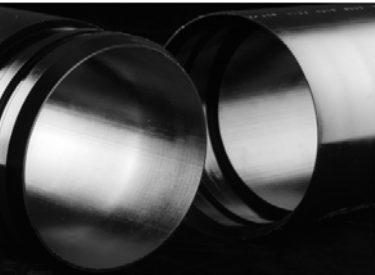
4.1 QA/QC CERTIFICATION-

4.1.1 The HDPE riser supplier shall submit certification that the HDPE material meets the specifications.

4.1.2 The fabricator of the HDPE riser shall submit drawings showing the position of the inlets, outlets and the overall dimensions along with any other special features such as manways, ladders, etc. Pipe to pipe connections shall be made using a Mechanical Connection which does not change the OD or ID of the pipes. The Snap-Tite Connection shall be used.

4.1.2.1 The fabricator shall submit data indicating that the riser has adequate strength to handle ring compression loading from water level and soil support.

4.1.2.2 Thickness of the bottom based on depth and groundwater. Thickness should be based on acceptable stress and deflection amounts.



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4.1.3 Calculations supporting these requirements will be part of the submittal package.
4.1.4 The fabrication technician shall perform work in accordance with butt fusion of high-density polyethylene per ASTM D2657, for extrusion and hot air welding per ASTM C-1147. The fabricator shall submit the written quality assurance program used during fabrication of the risers. The fabricator may be required to submit their overall QA/QC program for fabricating thermoplastic structures, the welding certification program for the fabrication technician per ASTM C 1147 and the facility safety program.

4.1.5 The riser and pipe shall be tested with water or air if made in a way that testing can be performed. The structure shall be determined to be leak free before shipping. A written certification shall be sent to the engineer certifying that the HDPE riser is leak free. The test results shall become part of the submittal.

4.2 APPROVAL OR REJECTION

4.2.1 Written approval or rejection of substitution shall be given by the ENGINEER.

4.2.2 ENGINEER may reserve the right to require proposed product to comply with the black color of specified product.

4.2.3 In the event substitution results in a change of Contract Price or time, provisions in the Agreement will be applied for adjustment.

4.2.4 Substitutions will be rejected if:

4.2.4.1 Submittal is not through the CONTRACTOR with his stamp or approval.

4.2.4.2 Requests are not made in accordance with this Section.

4.2.4.3 In the ENGINEERS opinion, acceptance will require substantial revision of the original design.

4.2.4.4 In the ENGINEERS opinion, substitution is not equal to original product or will not perform adequately the function for which it is intended.

4.3 THIRD PARTY TESTING- The owner of the specifying engineer may request certified lab data to verify the physical properties or materials not meeting the requirements of this specification.

4.4 DEVIATIONS - Procedure for requesting substitute

4.4.1 Consider after award of Contract.

4.4.2 A letter defining the deviation and justification must be sent to the engineer.

The letter must identify:

4.4.2.1 The Product

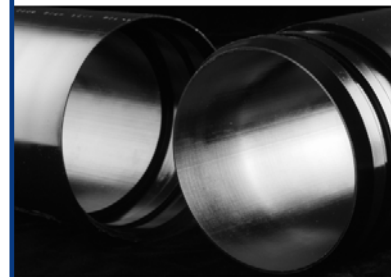
4.4.2.2 Manufacturer's Name

4.4.2.3 Representative Contact Name and Telephone Number

4.4.2.4 Specification Section or drawing reference of originally specified product.

4.4.2.5 Discrete name or tag number assigned to original product in the Contract Document.

4.4.3 Manufacturer's literature clearly marked to show compliance of proposed product with Contract Document.



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4.4.4 Itemize comparison of original and proposed product addressing product characteristics including but not necessary limited to:

4.4.4.1 Size

4.4.4.2 Composition or material of construction

4.4.4.3 Weight

4.4.4.4 Electrical or mechanical requirements

4.4.4.5 Product Experience:

4.4.4.5.1 Location of past projects utilizing product

4.4.4.5.2 Name and telephone numbers of persons associated with referenced projects knowledgeable concerning proposed product.

4.4.4.5.3 Available field data and reports associated with proposed products

4.4.4.6 Data relating to changes in construction schedule.

4.4.4.7 Data relating to changes in cost.

4.4.4.8 Samples: At request of the Engineer, a full size sample may be required. This sample maybe held by the Engineer until completion of the project.

4.5 REJECTION- The high-density polyethylene manholes may be rejected for failure to meet any of the requirements of this specification.

5. HDPE RISER CONSTRUCTION

5.1 The HDPE Riser shall be constructed of HDPE pipe with a nominal OD and DR determined by service conditions. For sizes above 63", a profile wall pipe can be used. Calculations must be provided to verify the wall thickness to be used.

5.2 The bottom thickness of the riser will be determined in accordance with ASTM F 1759. Calculations must be provided to verify the wall thickness to be used.

5.3 Factory installed inlets and outlets shall be extrusion welded on the inside and outside of the structure using good welding practice.

5.4 The ladders in the top of the risers, if specified, shall conform to OSHA requirements.

5.5 Top of the riser shall be built to the requirements of the drawings. If air testing is required, flanged tops or manways will be required. Reinforced concrete pads spanning the HDPE riser will be required when HDPE risers are used in traffic areas. A traffic rated frame and cover will be required. A professional engineer shall approve the design of the concrete pad. His or her calculations must be included in the submittal.

5.6 Where large changes in temperature are expected, restraints shall be designed as an integral part of the riser by the fabricator/manufacturer to prevent strain at the inlets or outlets. These restraints shall be cast into a concrete collar around the pipe. Anti-flotation and/or anti-settling anchor collars, if required, shall be designed as an integral part of the riser by the fabricator/manufacturer of the manhole. Shop drawings, approved by the specifying engineer, shall be required for restraints, anchors, collars, etc. . . . that are designed by the riser fabricator/manufacturer prior to acceptance of the HDPE structures.



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6. CONSTRUCTION PRACTICES

6.1 Handling of risers. HDPE risers shall be stored on clean, level, and dry ground to prevent undue scratching or gouging of the pipe. The handling of HDPE riser shall be done in such a manner that there is no damage. Nylon slings are often used.

7. DIRECT BURIAL INSTALLATION

7.1 Trench Construction-The trench and trench bottom shall be constructed in accordance with ASTM D-2321, Section 6, Trench Excavation, and Section 7, Installation. The HDPE riser shall be installed on a stable base consisting of 12" of class I materials compacted to 95% proctor density per ASTM F 1759, Section 4.2. All required safety precautions for manhole installation are the responsibility of the contractor.

7.2 Embedment materials shall be Class I or Class II materials as defined by ASTM D2321 Section 5, Materials. Class I materials are preferred. Backfill and bedding materials shall be free of debris.

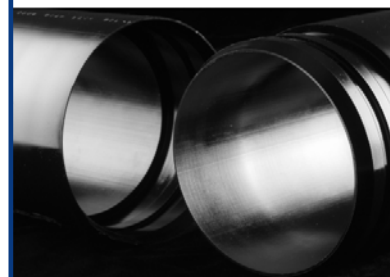
7.3 Bedding of the riser shall be performed in accordance with ASTM D 2321, Section 7.2. Compaction shall conform to Section 7.5 and 7.5.1.

7.4 Backfilling shall be done to conform to the ASTM F 1759, Section 4.2, "Design Assumptions". This Specification indicates that backfill shall extend at least 3.5 feet beyond the edge of the manhole for the full height of the manhole and extend laterally to undisturbed soils. Compaction shall be to 90% proctor density.

7.5 H-20 Highway Loads-Reinforced concrete pads spanning the HDPE riser will be required when HDPE risers are used in traffic areas. A traffic rated frame and cover will be required. A drawing showing key design features must be submitted as indicated in Section 5.7 of this specification.

NOTE: Please read this section carefully. Not all parts may apply to your project. Remove sections that do not apply. Add sections that are specific to your project.

ISCO Industries, LLC has carefully checked the accuracy and standards used in the preparation of these sample specifications, it does not guarantee or warranty piping or manhole installations. Sample specifications are to be used as a guide to assist engineers and owners of piping systems containing HDPE risers. Sample specifications do not cover all situations or applications. These specifications are not intended to provide installation training or instructions. Since every job is different, a trained professional engineer should be used to determine the needs of a particular job.



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