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Model Specification for Large Diameter Profile Wall High Density Polyethylene Pipe Culvert Liners

# 1. GENERAL

## 1.1. Scope

1.1.1. This model specification provides minimum requirements for Large Diameter High Density Profile Wall Polyethylene Pipe Culvert Liners. The model specification may be adopted in full or modified by the specifier to suit the project requirements. *[Options for the specifier are denoted by square brackets and italics].*

## 1.2. References

1.2.1. Unless otherwise specified, references to documents shall mean the latest published edition of the referenced document in effect at the bid date of the project.

| *Reference* | | *Title* |
|---|---|---|
| *ASTM* | *D3350* | *Standard Specification for Polyethylene Plastic Pipe and Fittings Materials* |
| | *F894* | *Standard Practice for Underground Installation of Thermoplastics Pipe for Sewers and Other Gravity Flow Applications.* |
| *ISO* | *9001* | *Quality Systems, Model for Quality Assurance in Production and Installation* |
| *PPI* | *PPI Handbook* | *The Plastic Pipe Institute Handbook of Polyethylene Pipe, Second Edition.* |

# 2. PRODUCTS

## 2.1. Qualification of manufacturers

2.1.1. The general quality assurance practices and methods shall be in accordance with ISO 9001.

2.1.2. *[Upon request the customer or engineer shall be allowed access to the manufacturer's plant facilities to audit, witness and inspect the methods, practices, tests and procedures of the quality assurance program.]*

## 2.2.Materials

2.2.1. The closed profile wall pipe shall be manufactured from a high density polyethylene material which meets or exceeds the minimum cell classification requirements for base materials as specified in ASTM F894 when classified in accordance with ASTM D3350.

2.2.2. The pipe material shall contain 2% - 3% well dispersed carbon black. Additives which can be conclusively proven not to be detrimental to the pipe may also be used, provided the pipe produced meets the requirements of this specification.

2.2.3. The pipe material shall be resistant to corrosion resulting from the presence of Hydrogen Sulfide and pH values between 2 and 13.

## 2.3.Approved pipe and manufacturers

2.3.1. Weholite from Infra Pipe, or approved equal. **2.4.Pipe**

2.4.1. The pipe shall be manufactured in accordance with the requirements of ASTM F894 which shall be verified by a 3rd party certification body.

2.4.2. The standard round size pipe shall be manufactured with *[_____] [Select 'threaded' or 'profile cut' or 'straight']* ends[1].

2.4.3. The round size pipe shall have a Ring Stiffness Class (RSC)[2] *[_____]* as necessitated by structural evaluation of burial, installation and application loads.

2.4.4. The round pipe shall be manufactured in pipe lengths of *[_____]*. *[For sizes ≤ 96" NPS the standard laying lengths are 16.5ft/5.03m, 25ft/7.62m and 50ft/15.24m. For sizes> 96" NPS the standard laying lengths are 20ft/6.09m and 40ft/12.19m.]*

2.4.5. No other laying lengths may be used without the Engineer's written approval.

## 2.5.Oval Pipe

2.5.1. The ovalized pipe must be produced from pipe meeting the requirements of section 2.4.

2.5.2. An oval shaped pipe shall be manufactured with *[_____] [Select 'profile cut' or 'straight']* ends.

2.5.3. An oval pipe shall be manufactured in pipe length of *[_____].*
*[The standard laying lengths are 20ft/6.09m and 25ft/7.62m]*

[1] Pipe lengths with threaded ends can be screwed together, while profile-cut ends enable pipes to be field extrusion welded. Profile cut or straight cut ends can be mechanically coupled.
[2] Ring Stiffness Class (RSC) as defined in ASTM F894

2.5.4. An ovalized liner shall be braced in both the horizontal and vertical axis as to maintain the oval shape before delivery to the jobsite. Bracing shall not be removed until the liner has been completely installed and the grout has fully cured.

## 3. MARKING AND SHIPPING

### 3.1. Marking

3.1.1. The pipe shall be marked in accordance with the ASTM F894 standard.

### 3.2. Shipping

3.2.1. Unless otherwise specified by the purchaser, shipping shall be done in accordance with the manufacturer's instructions. Care shall be taken to prevent cuts, scratches and other damage.

## 4. CONSTRUCTION PRACTICES

### 4.1. Inspection of Materials

4.1.1. The customer shall inspect all pipe and accessories for shortages, loss or damage upon receipt of the shipped material at the time of unloading, recording this information directly on the waybill received from the carrier.

4.1.2. The customer shall notify their Sales Manager and/or Uponor Customer Service immediately in writing detailing any shortages, loss or damages. Where possible electronic photos should be taken of all damage claims.

### 4.2. Handling and Storage

4.2.1. Handle the pipe in accordance with the PPI Handbook of Polyethylene Pipe (2nd Edition), Chapter 2 using approved strapping and equipment rated for loads encountered.

4.2.2. Minor scuffing or scratching does not reduce the serviceability of the pipe. Gouges or sharp cuts that are greater than 10% of the wall shall be repaired as per pipe manufacturer's recommendation.

4.2.3. When handling the pipe with slings, use wide fabric choker slings capable of safely carrying the load. Use such slings for lifting, moving, and lowering pipe and fittings. When lifting the pipe, two (2) lift points are required. This may be accomplished by using an inverted 'Y' or a spreader bar to separate the fabric slings. Wire rope and chains are prohibited.

## 5. JOINING METHODS

5.1.1. Joining shall be accomplished by *[_____]. [Select one of the two acceptable joint types[1]: Extrusion welding joint, Threaded joints].*

5.1.2. Extrusion welded joints shall meet the joint qualification requirements of ASTM D3212.

5.1.3. Joining shall be in accordance with the pipe manufacturer's construction and installation guidelines.

5.1.4. Extrusion welding shall be performed by the pipe manufacturer's field service technician(s) or other party(s) demonstrating proper certification of training in extrusion welding and/or as approved by the engineer.

## 6. INSTALLATION

### 6.1. General

6.1.1. Safe Working Environment: Through all steps of construction, all necessary precautions shall be taken to ensure a safe working environment in accordance with all applicable safety codes and standards.

### 6.2. Inspection and Cleaning

6.2.1. Prior to sliplining, the host pipe shall be inspected, thoroughly cleaned, and the liner clearance should be verified. Any obstruction, protrusions, joint offsets, debris etc. that could damage the liner or prevent insertion of the liner pipe shall be repaired or removed prior to the relining operation.

6.2.2. It shall be the responsibility of the contractor to clear the line of obstructions, solids, dropped joints, protruding service connections or collapsed pipe that will prevent the insertion of the liner pipe. This work shall be approved by the owner prior to the commencement of the work.

### 6.3. Insertion

6.3.1. The insertion area should be located considering conditions of the host culvert, surface conditions and pulling or pushing distances. This area should provide clear access to the host culvert in which to align and join adjacent lengths of liner pipe.

6.3.2. The liner pipe grade shall be maintained parallel to grade of the host culvert.

6.3.3. When the annular space between liner pipe and host culvert is sufficiently large, wood blocks or other timber framing may be positioned above the liner pipe to maintain the invert at the desired elevation during the grouting operation. A plan detailing how the liner pipe will be maintained at the desired elevation shall be submitted by the contractor to the owner for approval.

[1] Ovalized pipe can be joined only with extrusion welding

## 6.4. Pipe Connections

6.4.1. The liner pipe shall be capable of being joined into a continuous length. The joint shall be adequate for pushing or pulling[1] the liner pipe through the host culvert.

6.4.2. After the liner pipe is installed, the contractor shall restore service to all laterals.

## 6.5. Sealing at Termination Points

6.5.1. The annulus between the liner pipe and the host pipe shall be sealed at termination points. Bulkheads shall be constructed in sequence from upstream to downstream allowing water trapped in the annulus to escape. The bulkheads should be capable of resisting all forces that may occur during the grouting operation. Depending on the grouting method employed, grout tubes and ventilation tubes shall be constructed into the bulkheads

## 6.6. Grouting

6.6.1. After the liner pipe is in place, the area between the liner pipe and the host culvert including voids in the pipe zone shall be completely filled with flowable grout.

6.6.2. The annular grout should have a 28 day compressive strength greater than 100 psi.

6.6.3. A detailed grouting plan shall be developed by contractor and submitted to the owner for approval. The plan shall include at a minimum the following:

a) Grout insertion method (e.g. holes drilled from grade through the crown of the host culvert, gravity flow or low pressure pumping of grout from upstream bulkhead to downstream bulkhead)
b) Grout design
c) No. of grout lifts to prevent floating or shifting of the liner
d) Maximum anticipated grout pressure that will be applied to the liner pipe

6.6.4. The grout should be low-density foam concrete. If standing water is present, a high-density grout should be used to displace the water and fill the annular space.

6.6.5. Grouting pressure shall not exceed the maximum recommended allowable grout pressure for the liner pipe.

6.6.6. The contractor shall be solely responsible for any damage or distortion to the liner pipe due to the grouting process.

[1] Pipe pushing and pulling load information should be obtained from pipe manufacturer.

### 6.7.Clean-up and Restoration

6.7.1. Upon acceptance of the installation work and testing, the contractor shall clean-up and restore the project area affected by operations as approved by the owner.

END SECTION