

SPECIAL SPECIFICATION

Culvert Pipe Rehabilitation with HDPE Pipe

1. **Description.** This Item shall govern for furnishing, installing, grouting and providing all labor, material and equipment necessary to rehabilitate existing culvert pipe by slip lining an existing culvert pipe with high density polyethylene (HDPE) pipe. The pipes shall be sizes, types, design and dimensions shown on the plans and shall include all connections, joints and other appurtenances as required to complete the work.

The slip lining process will require the contractor to completely grout the annular void between the host and insert pipe. The grouting process shall be considered subsidiary to this item.

2. **Materials.** Unless otherwise specified on the plans or herein, culvert pipe renewal shall conform to the following:

Culvert Liner as provided by ISCO Industries at 800-233-1305.

A. Liner Material - High Density Polyethylene (HDPE) Pipe

1. High density polyethylene pipe and fittings shall meet the requirements in the AASHTO M326 Specification. Contractors must furnish a certificate of compliance at bid time from the pipe manufacturer that the liner pipe to be installed has been tested by a certified 3rd party laboratory and meets all AASHTO M326 requirements. The certification must list the laboratory and contact person with phone number.
2. **Raw Materials.** The pipes and the fittings shall be manufactured from PE resin compounds, which conform to the requirements of cell class 345464C as defined and described in ASTM D 3350-05.
3. **HDPE Resin Specifications.**

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

B. Designation of Type.

1. The HDPE pipes used for liners in gravity flow culverts shall be solid wall construction with mechanical end connectors, male and female.
2. Individual liner section lengths shall be a minimum of 9-ft but shall not exceed 50 ft. unless pre-approved

C. Pipe joints shall comply with ASTM D3212 Standard Specification for Joint tightness.

D. Hydraulic flow characteristics for the liner pipe shall provide a Manning's coefficient of $n = 0.00914$.

E. **Grouting Material.** Contractor shall utilize material specifications for solidification of the annular void between host and the inserted liner with low density flowable fill or cellular grout. The grouting material shall have a density of not less than 40 lbs per cubic foot nor greater than 125 lbs per cubic foot..

3. **Cleaning.** The existing culvert pipe shall be cleaned by whatever means necessary to remove all obstructions which may be encountered that would prevent insertion of the pipe liner into the host pipe as approved by the engineer. This work will not be paid for directly, but shall be considered subsidiary to this item

4. **Construction.**

A. **Liner Pipe.** Liner pipe shall be inserted and installed in accordance with manufactures recommendations. Slip liner pipe grade shall be maintained parallel to grade of host pipe.

B. **Grouting.** Upon completion or partial completion of the slip lining process grouting will be required to be placed in the annular void between the insertion pipe and the host pipe. Cellular grout with a density between 40 and 125 lbs per cubic foot shall be used.

A detailed plan on holding the liner pipe on the invert of the host pipe shall be submitted to the engineer for approval.

The annular void shall be completely grout filled without deflecting the insertion pipe greater than 1.5 percent.

The contractor shall provide bulkheads at the open points of each run of pipe to be grouted.

Acceptable grout points shall be at bulkheads only for host pipe constructed with Reinforced Concrete Pipe (RCP). Penetration of the host pipe shall be permitted for host pipe constructed with Corrugated Metal Pipe (CMP) to facilitate grouting of the annular void. Multiple fills pipes will be required.

The annular void shall be grouted solid by injecting grout from one end of the pipe run and allowing it to flow toward the other end. Venting of the annular void shall be performed to assure uniform filling of the void space during the grouting process.

An open ended, high point tap or equivalent vent must be provided and monitored at the bulkhead opposite to the point of grouting.

Pressure on the annular void shall not exceed 2 PSI to avoid damage to the liner pipe. Regardless of the pressure, the contractor shall be solely responsible for any damage or distortion to the insertion pipe due to the grouting process.

C. Pipe Stockpiling and Handling. Pipe and fittings shall be stockpiled in a safe manner at each contractor staging area or pit location. The stockpiling shall be arranged to cause a minimum of interference to pedestrian and stored outside the safety clear zone of vehicular traffic. When handling slip lining pipe, the contractor shall take all precautions necessary to avoid damaging the pipe. No liner pipe shall be permitted to drag across the ground. All liner pipe must be fully supported or carried above the ground while being moved until inserted into the host culvert. Pipe with deep cuts, scratches, or gouges shall be rejected or replaced at the entire expense of the contractor. If pipe is found to have developed an irregular shape that will not allow pipe joining or insertion without the use of outside forces to bring pipe to round shape, it shall be rejected and replaced at the entire expense of the contractor. An irregularly shaped pipe that would necessitate the use of undue force that could cause damage to the pipe or the joints shall be rejected and replaced at the entire expense of the contractor.

5. **Clean-up and Restoration.** 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 Engineer.
6. **Measurement.** This item shall be measured by the foot. Such measurement shall be made along the flow line of the liner pipe complete in place.

For multiple culverts to be lined, the measurement length shall be the sum of the lengths of each barrel, measured as prescribed above.

The accepted quantities of pipe liner, thermoplastic, will be paid for at the contract unit price per linear foot for the size of the existing pipe in which the liner is installed, complete in place.

7. **Payment.** The work performed and the materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for as the unit bid for "Slip Lining Culvert Pipe" of the type, design (if required) and size specified. This price shall be full compensation for cleaning existing pipe; for furnishing, hauling, installing liner pipe and placing grout, all connections and for all labor, tools equipment, materials, clean-up and incidentals.