

**ITEM 25555.0820 M - GROUTING OF SLIPLINING ANNULUS**

**1. DESCRIPTION:**

- 1.01 Under this Item, the Contractor shall furnish and install a cementitious grout in the annular space between the existing concrete culvert pipe and the new high density polyethylene liner pipe. The work shall be done in accordance with these specifications and in conformity with the lines, grades, thicknesses and typical sections shown on the plans or established by the Engineer in writing.

**2. MATERIALS:**

- 2.01 The Contractor has the option of using one of two materials for either pipe size. The applicator who shall perform the mixing and installing of the grout shall have had previous experience in this type of grouting work.

2.02 **Annulus Grout Type A:**

1. The grout shall be a mixture of 75% pozzolanic fly ash and 25% cement plus a high grade gel to control bleed and a dispersant to lower the viscosity for increased pumpability. **Coarse sand and/or aggregate shall not be used.**

2. **The 28 day compressive strength shall be at least** 103. Mpa (1500 psi) (reference ASTM C-109-84).

3. The set grout shall have a high sulfate resistance.

The mixed grout shall have a low slurry viscosity; apparent viscosity shall be between 500 and 1500 cp at 5.1/sec.

4. Slurry density of the mixed grout shall be at least 5.87 kg/m<sup>3</sup> (94 pounds per cubic foot).
5. All grout materials should be dry blended prior to mixing with water. Storage at the job site shall be as a dry material.
6. The grout mixer shall be a high shear, high energy colloidal mixer of sufficient rate and capacity to meet the grout placement requirements without causing delays. A colloidal mixer is necessary to achieve the best uniform mixture and density.
7. Annulus grout (Type A) shall be Halliburton LG-3 Sewer Liner Annular Grout or Dowell and Schlumberger DS-1500.

2.03 **Annulus Grout Type B:**

- A. Materials shall meet the requirements of the following:

<b>Materials</b>	<b>Subsection</b>
Portland Cement (Types I, II or III)	701-01
Water	712-01
Admixtures	711-08

**2. MATERIALS:** (cont'd)

**ITEM 25555.0820 M - GROUTING OF SLIPLINING ANNULUS**

2.03 **Annulus Grout Type B:** (cont'd)

**Foaming Agent:**

The foaming agent shall conform to the requirements of ASTM C-869 and shall be supplied by Elastizell Corporation of America, Ann Arbor, Michigan or the Mearl Corporation, Roselle Park, New Jersey.

B. The lightweight concrete fill shall conform to the following values and shall be mixed in accordance with the recommendations of a representative of the supplier of the foaming agent:

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<b>MAXIMUM</b>	<b>MINIMUM</b>
<b><u>CAST WET DENSITY</u></b>	<b><u>COMPRESSIVE</u></b>
<b>26 kN/m<sup>3</sup> (42 PCF)</b>	<b>0.83 MPa (120 PSI)</b>

and thereal technical data.

The Contractor shall be responsible for designing the mix so that the lightweight concrete fill meets the above criteria.

C. During initial placement of the lightweight concrete grout, the density shall be determined at the point of placement and the mix adjusted by the Contractor, as required, to obtain the specified Cast Wet Density.

At 30 minute intervals during placing, the density shall be monitored by the Engineer and the Contractor shall adjust his operations as necessary to maintain the specified Cast Wet Density. A representative of the supplier of the foaming agent shall be on site to advise the Contractor on his operations.

Specimens for determination of the compressive strength shall be taken at the point of placement by the Engineer. Sampling shall be in accordance with procedures as follows:

1. Four representative samples 150 mm x 300 mm (6" x 12") cylinders shall be taken for each day's pour or each 76 cubic meters (100 cubic yards) of material placed, whichever is the greater. The time and location of the sample shall be noted in the field report.
2. The cylinders shall be overfilled by pouring concrete down the insides of the cylinders. This allows air to escape during filling. The sides and bottom shall be tapped to close any accidentally entrained air voids. Strike off the top of the cylinder ( not more than three times) and cover. **DO NOT ROD LOW DENSITY CONCRETE CYLINDERS.**

2. **MATERIALS:** (cont'd)

2.03 **Annulus Grout Type B:** (cont'd)

## ITEM 25555.0820 M - GROUTING OF SLIPLINING ANNULUS

3. Mark the sample and place the sample in a location where it will not be disturbed nor subjected to temperature extremes. Temperature extremes are temperatures below 7°C or above 29°C. Excessive handling may damage these test cylinders. After 24 hours the Engineer shall ship the cylinders for testing.
4. At 28 days the cylinders shall be compression tested in accordance with ASTM C495 except that there shall be no oven drying prior to compressive testing.

### **3. CONSTRUCTION DETAILS:**

- 3.01 Mixing and placing operations shall be under the supervision of the Engineer.
- 3.02 The Contractor shall prepare the work area for annulus grouting in accordance with the details on the plans, these specifications, and as required to adequately complete the work. This shall include control of seepage and stream flow water. Control of water shall include temporary cofferdams, pumping, and joint sealing. The Contractor shall furnish and install a back-up pumping system and shall provide manpower to continuously maintain pumping during the time requiring control of water. The Contractor shall submit this plan for control of water and demonstrate that he has adequate equipment capable of handling the encountered flows.
- 3.03 Surface against which the grout is to be placed shall be free of ice and standing water and shall be at a temperature of 2°C or higher. Bulkheads shall be placed at the ends of each section to be grouted with the fill pipe inserted into the bulkhead at one end with a pressure relief pipe at the other end extended above the pipe. An invert drain pipe shall be provided at the low end of the annulus.
- 3.04 The Contractor shall take all necessary precautions during the grouting process to prevent the liner pipe from "floating". This shall include filling the liner pipe with water and strutting as detailed on the plans. Grout shall be placed in 2 stages. The first placement will be up to the Spring Line of the Liner.
- 3.05 The Contractor shall limit the maximum difference between external fluid pressure and the internal fluid pressure on the polyethylene liner pipe necessary to prevent collapse. The maximum fluid pressure difference at the liner invert shall be as follows:  
  
1830 mm (72") H.D.P.E. Liner – 153 Pa (3.19 psi) external at 1.40 m (4.6') of grout (Spring Line)  
1930 mm (76") H.D.P.E. Liner – 145 Pa (3.02 psi) external at 1.31 m (4.3') of grout (Spring Line)  
  
The Contractor shall establish a procedure for continuous and accurate monitoring of the internal and external fluid pressure. The Contractor shall submit details to monitor the external pressure difference for approval.
- 3.06 The Contractor shall design all permanent and temporary bulkheads to adequately resist all hydrostatic and grouting pressures. The Contractor shall submit manufacturer's certification that inflatable plugs or airballs will be able to resist the maximum applied head. Details of bulkheads and blocking for plugs shall be submitted for approval. Submittals shall include calculation of maximum design pressures and total load for each component.

### **4. METHOD OF MEASUREMENT:**

- 4.01 The quantity will be the number of cubic meter of grout incorporated into the complete work in accordance with the pipe dimensions shown on the plans and specifications or as directed by the Engineer.

**ITEM 25555.0820 M - GROUTING OF SLIPLINING ANNULUS**

**5. BASIS OF PAYMENT:**

5.01 The unit price bid per cubic meter shall include the cost of furnishing all labor, equipment and material required to complete the work as specified. Payment for the work performed in accordance with these specifications shall be made at the unit price bid under the above item.

This  
Specification  
has been  
Disapproved  
by request of Sam Candib of Materials  
The conversion between English and Metric are  
incorrect and there  
is inappropriate technical data.