

## SECTION 02222

### CONTROLLED LOW-STRENGTH MATERIAL BACKFILL (FLO-FILL)

#### PART 1 GENERAL

##### 1.01 SECTION INCLUDES

- A. The Contractor shall furnish and place controlled low strength material (CLSM) backfill bedding where shown on the Drawings. The pipeline trench shall be excavated to the proper lines, grades and dimensions and controlled low strength backfill placed under, along the sides and on top of the pipe. Unless otherwise shown in the Drawings, a minimum of one foot of controlled low strength backfill shall be placed over the crown of the pipe.
- B. Measurement and Payment Procedures
  - 1. For public funded capital improvement projects, measurement and payment procedures will be determined on a project by project basis.
  - 2. For privately funded development projects, Owner will determine measurement and payment requirements.

##### 1.02 RELATED WORK

- A. Section 02221: Trench Excavation and Backfill.

##### 1.03 REFERENCES

- A. ASTM C 33 - Concrete Aggregates
- B. ASTM C 94 - Specification for Ready-Mixed Concrete
- C. ASTM C 143 - Test Method for Slump of Hydraulic Cement Concrete
- D. ASTM C 150 - Portland Cement
- E. ASTM C 494 - Chemical Admixtures for Concrete
- F. ASTM C 618 - Fly Ash in Portland Cement Concrete
- G. ASTM D 4832 - Standard Test Method for Preparation and Testing of Soil-Cement Slurry Test Cylinders
- H. ASTM PS 28 - Provisional Standard Test Method for Flow Consistency of Controlled Low Strength Material
- I. ASTM PS 29 - Provisional Standard Test Method for Unit Weight, Yield and Air Content (Gravimetric) of Controlled Low Strength Material
- J. ASTM PS 30 - Provisional Standard Practice for Sampling Freshly Mixed Controlled Low Strength Material
- K. ASTM PS 31 - Provisional Standard Test Method for Ball Drop on Controlled Low Strength Material to Determine Suitability for Load Application

## **1.04 SUBMITTALS**

- A. A minimum of two days prior to starting CLSM work, CLSM shall be submitted for review and approval. No changes shall be made in the amounts or sources of the approved mix ingredients without the approval of the Inspector. Product inspection and field testing of the approved mix may be made by, or on-behalf of, the Owner.

## **PART 2 PRODUCTS**

### **2.01 MATERIALS**

- A. General: The CLSM bedding shall consist of a mixture of sand, coarse aggregate, cement and water. Fly ash and approved admixtures may be used to obtain the required properties of the mix. The mix shall have good workability and flowability with self-compacting and self-leveling characteristics.
- B. The CLSM shall have a minimum cement content of 40 pounds per cubic yard. The water-cementitious materials ratio of the mix shall not exceed 3.5:1
- C. Cement: All cement used shall be Type II Portland cement that shall conform to the requirements of ASTM C 150.
- D. Fly Ash: Fly ash may be either Class C or Class F. The fly ash shall conform to ASTM C 618.
- E. Aggregates:
  - 1. Fine Aggregate: All fine aggregate shall conform to the grading and quality requirements of ASTM C 33.
  - 2. Coarse Aggregate: Coarse aggregate shall conform to the grading and quality requirements of ASTM C 33 for size No. 476, No. 57 or No. 67.
- F. Water: The batch mixing water and mixer washout water shall conform to the requirements of ASTM C 94.
- G. Admixtures: Chemical admixtures that do not contain calcium chloride and conform to ASTM C 494 for concrete may be used in the CLSM mix. All chemical admixtures shall be compatible with the cement and all other admixtures in the batch.
- H. CLSM Proportions:
  - 1. Strength: CLSM shall have a minimum 28 day compressive strength of 60 psi and maximum 28 day compressive strength of 100 psi when molded and cured as in conformance with ASTM D 4832.
  - 2. Air-Entrainment: All CLSM shall be air entrained to a total air content of approximately 5%.
  - 3. Slump: The minimum slump shall be six inches and the maximum slump shall be eight inches as when tested in accordance with ASTM PS 28.
  - 4. Aggregate: Fine aggregate shall be between 50% and 60% by volume of the total aggregates in the CLSM mix.

5. Consistency: The consistency of the CLSM slurry shall be such that the material flows easily into all openings between the pipe and the lower portion of the trench. When trenches are on a steep slope, a stiffer mix of slurry may be required to prevent CSLM from flowing down the trench. When a stiffer mix is used, vibration shall be performed to ensure that the CLSM slurry completely fills all spaces between the pipe and the lower portion of the trench.

### **PART 3 EXECUTION**

#### **3.01 PLACEMENT**

- A. CLSM shall be used as an alternative to backfill, as directed by the INSPECTOR, but may not be used as a substitute for bedding material.
  1. Rodding, mechanical vibration and compaction of CLSM shall be performed to assist in consolidating the CLSM.
  2. CLSM shall be placed as closely behind pipe laying operations as possible.
  3. When required to prevent uplift, the CLSM shall be placed in two stages as required, allowing sufficient time for the initial set of the first stage before the remainder is placed. CLSM shall be deposited as nearly as practical in its final position and in no way disturb the pipe trench or cause foreign material to become mixed with the CLSM.
  4. Soil backfill shall not be placed until the CLSM has reached the initial set. If backfill is not to be placed over the CLSM within 8 hours, a 6-inch cover of moist earth shall be placed over the CLSM surface.
  5. If the air temperature is 50° F or less, the moist earth cover should be at least 18-inches thick. CLSM shall not be placed when the air temperature is below 40° F unless the air temperature is 35° F or more and the temperature is rising.
  6. CLSM shall not be placed, if, in the judgment of the INSPECTOR, weather conditions are unsuitable.
  7. CLSM shall not be placed when the trench bottom or walls are frozen or contain frozen materials.

**END OF SECTION**