



SECTION 31 23 23

FLOWABLE FILL

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. CONTRACTOR shall furnish and place controlled low strength material (CLSM) backfill bedding where shown in the DRAWINGS. The pipeline trench shall be excavated to the proper lines, grades, and dimensions and CLSM placed under, along the sides, and on top of the pipe. Unless otherwise shown in the DRAWINGS, a minimum of one (1) foot of CLSM shall be placed over the crown of the pipe.

1.02 RELATED SECTIONS

- A. The following is a list of SPECIFICATIONS which may be related to this section:
 - 1. Section 01 57 19, Temporary Environmental Controls
 - 2. Section 31 23 19, Dewatering.
 - 3. Section 31 23 33, Trenching and Backfilling.

1.03 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
 - 1. ASTM International (ASTM):
 - a. C33, Standard Specification for Concrete Aggregates.
 - b. C94, Standard Specification for Ready-Mixed Concrete.
 - c. C143/C143M, Standard Test Method for Slump of Hydraulic-Cement Concrete.
 - d. C150, Standard Specification for Portland Cement.
 - e. C494/C494M Rev A, Standard Specification for Chemical Admixtures for Concrete.
 - f. C618, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
 - g. D4832, Standard Test Method for Preparation and Testing of Controlled Low Strength (CLSM) Test Cylinders.
 - h. D5971, Standard Practice for Sampling Freshly Mixed Controlled Low-Strength Material.



- i. D6023, Standard Test Method for Density (Unit Weight), Yield, Cement Content, and Air Content (Gravimetric) of Controlled Low-Strength Material (CLSM).
- j. D6024, Standard Test Method for Ball Drop on Controlled Low-Strength Material (CLSM) to Determine Suitability for Load Application.
- k. D6103, Standard Test Method for Flow Consistency of Controlled Low-Strength Material (CLSM).

1.04 SUBMITTALS

- A. A minimum of two (2) days prior to starting CLSM WORK. Provide product data on the following:
 1. CLSM mix design
 2. Fly Ash
 3. Admixtures

PART 2 PRODUCTS

2.01 MATERIALS

- A. General:
 1. The CLSM bedding shall consist of a mixture of sand, coarse aggregate, cement and water.
 2. Fly ash and approved admixtures may be used to obtain the required properties of the mix.
 3. The mix shall have good workability and flowability with self-compacting and self-leveling characteristics.
 4. No changes shall be made in the amounts or sources of the approved mix ingredients without the approval of ENGINEER.
 5. Product inspection and field-testing of the approved mix may be made by, or on behalf of, OWNER.
- B. Cement: All cement used shall be Type II Portland cement which shall conform to the requirements of ASTM C150.
- C. Fly Ash: Fly ash may be either Class C or Class F. The fly ash shall conform to ASTM C618.
- D. Aggregates:
 1. Fine Aggregate: All fine aggregate shall conform to the grading and quality requirements of ASTM C33.



2. Coarse Aggregate: Coarse aggregate shall conform to the grading and quality requirements of ASTM C33 for size No. 476, No. 57, or No. 67.
- E. Water: The batch mixing water and mixer washout water shall conform to the requirements of ASTM C94.
- F. Admixtures:
1. Chemical admixtures that do not contain calcium chloride and conform to ASTM C494/C494M for concrete may be used in the CLSM mix.
 2. All chemical admixtures shall be compatible with the cement and all other admixtures in the batch.
- G. CLSM Proportions:
1. Strength: CLSM shall have a minimum twenty-eight (28) day compressive strength of one hundred (100) psi when molded and cured as in conformance with ASTM D4832.
 2. The CLSM shall have a minimum cement content of fifty (50) pounds per cubic yard. The water-cementitious materials ratio of the mix shall not exceed three and one-half to one (3.5:1).
 3. Air-Entrainment: All CLSM shall be air entrained to a total air content of approximately five percent (5%).
 4. Slump: The minimum slump shall be six (6) inches and the maximum slump shall be eight (8) inches when tested in accordance with ASTM D6103.
 5. Aggregate: Fine aggregate shall be between fifty percent (50%) and sixty percent (60%) by volume of the total aggregates in the CLSM mix.
 6. Consistency:
 - a. 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.
 - b. When trenches are on a steep slope, a stiffer mix of slurry may be required to prevent CLSM from flowing down the trench.
 - c. 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 GENERAL

- A. CLSM shall be placed as closely behind pipe laying operations as possible.
- B. CLSM shall not be placed, if, in the judgment of ENGINEER, weather conditions are unsuitable.



- C. CLSM shall not be placed when the trench bottom or walls are frozen or contain frozen materials.
- D. CLSM shall not be placed when the air temperature is below forty degrees Fahrenheit (40°F) unless the air temperature is thirty five degrees Fahrenheit (35°F) or more and the temperature is rising.

3.02 PLACEMENT

- A. Pipe shall be placed on two (2) sandbags and leveled to the proper grade. Precast or other types of rigid pads that constitute a point load are unacceptable.
- B. CLSM shall be placed under the pipe from one side so that it flows under the pipe until it appears on the other side.
 - 1. CLSM shall be added to both sides of the pipe until it completely fills the space between the pipe and the sides of the trench, to the depths shown in the DRAWINGS.
 - 2. Rodding, mechanical vibration and compaction of CLSM shall be performed to assist in consolidating the CLSM.
- C. When required to prevent uplift, the CLSM shall be placed in two (2) stages as required, allowing sufficient time for the initial set of the first stage before the remainder is placed.
- D. 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.
- E. Soil backfill shall not be placed until the CLSM has reached the initial set.
 - 1. If backfill is not to be placed over the CLSM within eight (8) hours, a six-inch (6") cover of moist earth shall be placed over the CLSM surface.
 - 2. If the air temperature is fifty degrees Fahrenheit (50°F) or less, the moist earth cover should be at least eighteen inches (18") thick.

END OF SECTION