

## SECTION 03301

### CONTROLLED LOW STRENGTH MATERIAL (CLSM)

#### PART 1 GENERAL

##### 1.1 SECTION INCLUDES

- A. Furnishing and placing normal weight CLSM and light weight CLSM (i.e., cellular concrete grout).

##### 1.2 REFERENCES

- A. American Concrete Institute (ACI):
  - 1. 211.1 Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete.
  - 2. 229R Controlled Low-Strength Materials (CLSM).
  - 3. 301 Specifications for Structural Concrete.
- B. American Society for Testing and Materials (ASTM):
  - 1. C31 Standard Practice for Making and Curing Concrete Test Specimens in the Field.
  - 2. C33 Standard Specification for Concrete Aggregates.
  - 3. C94 Standard Specification for Ready-Mixed Concrete.
  - 4. C150 Standard Specification for Portland Cement.
  - 5. C172 Standard Practice for Sampling Freshly Mixed Concrete.
  - 6. C232 Standard Test Methods for Bleeding of Concrete.
  - 7. C403 Standard Test Method for Time of Setting of Concrete Mixtures by Penetration Resistance.
  - 8. C494 Standard Specification for Chemical Admixtures for Concrete.
  - 9. C495 Standard Test Method for Compressive Strength of Lightweight Insulating concrete.
  - 10. D4832 Standard Test Method for Preparation and Testing of Controlled Low Strength Material (CLSM) Test Cylinders.
  - 11. D6103 Standard Test Method for Flow Consistency of Controlled Low Strength Material (CLSM).

##### 1.3 SUBMITTALS

- A. Provide following submittals consistent with the provisions of Section 01300 SUBMITTALS.
- B. Shop Drawings:
  - 1. CLSM design mix, giving dry weights of cement, saturated surface-dry weights of aggregate, types, names and percent of admixtures, air content, and water used per cubic yard.
  - 2. Initial and final set times of design mix as determined by ASTM C403.
- C. Quality Control



1. Experience of ready mix plants supplying normal weight CLSM .
2. Experience of specialty contractors supplying light weight CLSM
3. Laboratory test data on seven (7) and twenty-eight (28) day strengths.

## 1.4 QUALITY ASSURANCE

- A. Ready mix plants and specialty contractors shall have a minimum of two years' experience producing CLSM of the type required. Submit list of projects including quantity, density and strength of CLSM supplied for similar projects in past two years as proof of experience.

## PART 2 PRODUCTS

### 2.1 CLSM MATERIALS

- A. CLSM shall consist of portland cement, aggregate, admixtures, and enough water to allow the material to flow freely. CLSM shall be self-leveling and self-compacting.
- B. Unless otherwise noted, all materials shall comply with requirements of ACI 229R.
- C. Portland Cement – ASTM C150 – Type I or Type II.
- D. Fine Aggregate: ASTM C33.
- E. Admixtures: Certified to be compatible with each other. Admixtures shall not contain calcium chloride. Flyash shall not be used in any CLSM mix that will be in direct contact with any soils.
- F. Water: Potable, clean and containing less than 100 ppm of chlorides. Free of any substances deleterious to lightweight CLSM foaming agent.

### 2.2 CLSM MIX DESIGN

- A. Consistency: The mixture of cement, aggregate, water and admixtures shall be proportioned to create a flowable slurry with a minimum flow of 8-inches when tested in accordance with ASTM D6103. The mix must be a homogenous slurry so the materials do not segregate upon deposition. Bleed water shall be no greater than 10 percent of the mixing water as measured by Method A of ASTM C232.
- B. Proportioning and Design of CLSM mixes. Field experience test data or laboratory test batches prepared in accordance with ACI 211.1 and ACI 301.
- C. Normal Weight CLSM:
  1. Excavatable by machine.
  2. 28-day compressive strength: 500 psi +/- 50 psi.
  3. Minimum compressive strength at three (3) days: 20 psi.  
Density: 110 pcf +/- 5 pcf.
  4. Preparation and testing of cylinders shall be in accordance with ASTM.

#### D. Light Weight CLSM:



1. Excavatable by machine.
2. Low density, non-bleeding cellular concrete.
3. Portland cement and water slurry blended with a high stability pre-generated foaming agent.
4. Fluid (10-inch slump), pumpable.
5. Wet Density: greater than 30 pounds per cubic foot.
6. Twenty-eight (28) day Compressive Strength: 100 psi minimum.
7. If water is present in the structure being abandoned, the CLSM shall have a minimum density of 70 pcf.

## 2.3 MIXING

- A. Sufficient mixing capacity shall be provided to permit the CLSM to be placed without interruption. The mixer drum shall be completely emptied prior to the initial batch of CLSM to ensure that no additional cement fines are incorporated into the mix.

## PART 3 EXECUTION

### 3.1 USES

- A. Normal weight CLSM shall be used where shown on the Drawings, or for the following at the CONTRACTOR's discretion:
  1. Structural fill.
  2. Bedding and backfill for piping.
  3. Trench stabilization.
- B. Light weight CLSM shall be used to fill structures and pipe shown to be abandoned in place on the Drawings.

### 3.2 CLSM PLACEMENT PROCEDURES

- A. Deposit CLSM by ready mix truck, pump, or other approved method by continuous discharging material in the space to be filled.
- B. Where used to backfill trenches above pipes to a specified elevation, delay placement of other fill until CLSM has gained sufficient strength to support the next layer to be placed.
- C. For piping located under paved areas, continue placing CLSM from the bedding surface through the pipe zone to the subgrade elevation. Excess excavated materials taken from these paved sections shall be reused in other areas or disposed.
- D. Where CLSM is shown on the Drawings for pipe bedding, placement shall be completed in stages to prevent uplift of the pipe. The first stage shall stop at one fourth the diameter of the pipe. After setting of the first lift, the second stage placement shall stop at mid height of the pipe. After setting of the second lift the remainder of the trench shall be filled in one operation.



### **3.3 LIMITATION OF OPERATIONS**

- A. CLSM shall not be placed on frozen ground. Mixing and placing may begin only if the air temperature is at least 35 degrees F and rising. At time of placement, CLSM shall have a temperature of at least 40 degrees F. Mixing and placing shall stop when the air temperature is 40 degrees F and falling.

### **3.4 FIELD QUALITY CONTROL**

- A. Provide adequate facilities for safe storage and proper curing of CSLM test cylinders onsite for first 24 hours, and for additional time as may be required before transporting to test lab.
- B. Provide CSLM for making cylinders from the point of discharge into forms. When CSLM is pumped, samples used shall be taken from discharge end of pump hose.

### **3.5 TESTING AND INSPECTION**

- A. COUNCIL shall coordinate with and schedule ITL for CLSM testing services.
- B. Cylinders shall be made in field and tested in laboratory in accordance with ASTM D4832.
- C. One sample shall be collected for every 25 cubic yards of CLSM.
- D. Strength level of CLSM will be considered satisfactory if average 28 day strength test results are within the strength range specified and three (3) day strength is at least 20 psi.

**END OF SECTION**