

SECTION 02153 CONTROLLED LOW-STRENGTH MATERIAL (CLSM)

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. The General Provision of the contract, including the General Provisions for Construction Projects (2016), Special Provisions, and General Requirements of the Specifications, apply to the work specified in this section.
- B. This Section shall be in accordance with FAA Specification Item P-153 – Controlled Low-Strength Material (CLSM), as included as an attachment to this Section.

1.2 SUMMARY

- A. This Section includes the requirements for furnishing and installing Controlled Low Strength Material (CLSM) as backfill in confined areas around structures, pipe lines or trenches, where specified or where access for compaction equipment is limited.
- B. Controlled Low Strength Material (CLSM) is a mixture of Portland cement, fly ash, aggregates and admixtures proportioned to provide a non-segregating, self-consolidating, free-flowing fill material that can be excavated by hand.

1.3 REFERENCES

- A. FAA Specification Item P-153 – Controlled Low-Strength Material (CLSM) as modified herein
- B. Section 02152, Excavation, Subgrade, and Embankment

1.4 SUBMITTALS

The Contractor must submit CLSM Mix Design in accordance with Section 01300, Submittals. Submit certified laboratory test results that the mix proportions and materials comply with these Specifications. Mix design proportions must be established based on experience with the plant's materials, established methods, and trial mixtures with the materials to be employed in accordance with ACI 318 Chapter 5. Submit certification on cementitious products and aggregates performed within the past 6 months, including:

- A. Cementitious materials
- B. Coarse and fine aggregates
- C. Admixtures

D. Water

PART 2 PRODUCTS

2.1 MATERIALS

Materials must conform to the following:

- A. Admixtures: Air entraining admixtures must meet ASTM C260. Air content shall be less than 15%.

2.2 MIXES

- A. Performance Requirements: Proportion the CLSM to be non-segregating, free-flowing, self-consolidating, low-shrink slurry.
- B. Mix Design Requirements: Determine the materials and proportions used to meet the requirements of the Specifications. The mix design must be prepared for a range of aggregate gradations that are expected to be used.
- C. Density: The density must be greater than 115 pcf.

2.3 SOURCE QUALITY CONTROL

Mix, transport, and place CLSM in accordance with the methods and procedures in ACI 304 and ASTM C94.

PART 3 EXECUTION

3.1 CONSTRUCTION METHODS

Controlled Low Strength Material shall be in accordance with FAA Specification Item P-153.

PART 4 MEASUREMENT AND PAYMENT

4.1 METHOD OF MEASUREMENT AND PAYMENT

- A. Method of measurement and basis for payment shall be in accordance with FAA Specification Item P-153, paragraph 153-5.1.

PART 5 ATTACHMENTS

5.1 FAA SPECIFICATIONS

- A. P-153, Controlled Low-Strength Material (CLSM)

END OF SECTION 02153

ITEM P-153 CONTROLLED LOW-STRENGTH MATERIAL (CLSM)

DESCRIPTION

153-1.1 This item shall consist of furnishing, transporting, and placing a controlled low-strength material (CLSM) as flowable backfill in trenches or at other locations shown on the plans or as directed by the Resident Project Representative (RPR).

MATERIALS

153-2.1 Materials.

a. Cement. Cement shall conform to the requirements of ASTM C150 Type I or II.

b. Fly ash. Fly ash shall conform to ASTM C618, Class C or F.

c. Fine aggregate (sand). Fine aggregate shall conform to the requirements of ASTM C33 except for aggregate gradation. Any aggregate gradation which produces the specified performance characteristics of the CLSM and meets the following requirements, will be accepted.

Sieve Size	Percent Passing by weight
3/4 inch (19.0 mm)	100
No. 200 (75 µm)	0 - 12

d. Water. Water used in mixing or curing shall be from potable water sources. Other sources shall be tested in accordance with ASTM C1602 prior to use.

MIX DESIGN

153-3.1 Proportions. The Contractor shall submit, to the RPR, a mix design including the proportions and source of aggregate, fly ash, cement, water, and approved admixtures. No CLSM mixture shall be produced for payment until the RPR has given written approval of the proportions. The proportions shall be prepared by a laboratory and shall remain in effect for the duration of the project. The proportions shall establish a single percentage or weight for aggregate, fly ash, cement, water, and any admixtures proposed. Laboratory costs are incidental to this item.

a. Compressive strength. CLSM shall be designed to achieve a 28-day compressive strength of 100 to 200 psi (690 to 1379 kPa) when tested in accordance with ASTM D4832, with no significant strength gain after 28 days. Not less than 188 pounds of cement shall be used for each cubic yard of material produced.

b. Consistency. Design CLSM to achieve a consistency that will produce an approximate 8-inch (200 mm) diameter circular-type spread without segregation. CLSM consistency shall be determined per ASTM D6103.

CONSTRUCTION METHODS

153-4.1 Placement.

a. Placement. CLSM may be placed by any reasonable means from the mixing unit into the space to be filled. Agitation is required during transportation and waiting time. Placement shall be performed so structures or pipes are not displaced from their final position and intrusion of CLSM into unwanted areas is avoided. The material shall be brought up uniformly to the fill line shown on the plans or as directed by the RPR. Each placement of CLSM shall be as continuous an operation as possible. If CLSM is placed in more than one lift, the base lift shall be free of surface water and loose foreign material prior to placement of the next lift.

b. Contractor Quality Control. The Contractor shall collect all batch tickets to verify the CLSM delivered to the project conforms to the mix design. The Contractor shall verify daily that the CLSM is consistent with 153-3.1a and 153-3.1b. Adjustments shall be made as necessary to the proportions and materials as needed. The Contractor shall provide all batch tickets to the RPR.

c. Limitations of placement. CLSM shall not be placed on frozen ground. Mixing and placing may begin when the air or ground temperature is at least 35°F (2°C) and rising. Mixing and placement shall stop when the air temperature is 40°F (4°C) and falling or when the anticipated air or ground temperature will be 35°F (2°C) or less in the 24-hour period following proposed placement. At the time of placement, CLSM shall have a temperature of at least 40°F (4°C).

153-4.2 Curing and protection

a. Curing. The air in contact with the CLSM shall be maintained at temperatures above freezing for a minimum of 72 hours. If the CLSM is subjected to temperatures below 32°F (0°C), the material may be rejected by the RPR if damage to the material is observed.

b. Protection. The CLSM shall not be subject to loads and shall remain undisturbed by construction activities for a period of 48 hours or until a compressive strength of 15 psi (105 kPa) is obtained. The Contractor shall be responsible for providing evidence to the RPR that the material has reached the desired strength. Acceptable evidence shall be based upon compressive tests made in accordance with paragraph 153-3.1a.

153-4.3 Quality Assurance (QA) Acceptance. CLSM QA acceptance shall be based upon batch tickets provided by the Contractor to the RPR to confirm that the delivered material conforms to the mix design.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

153-5.1 Work under this section will not be measured nor paid for separately, but shall be considered incidental to and included in the bid prices for the various items of work in this project.

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM C33	Standard Specification for Concrete Aggregates
ASTM C150	Standard Specification for Portland Cement
ASTM C618	Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C595	Standard Specification for Blended Hydraulic Cements
ASTM C1602	Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
ASTM D4832	Standard Test Method for Preparation and Testing of Controlled Low-Strength Material (CLSM) Test Cylinders
ASTM D6103	Flow Consistency of Controlled Low Strength Material (CLSM)

END OF ITEM P-153

END OF SECTION 02153