State of Ohio

Department of Transportation

SPECIAL PROVISION

**LOW DENSITY CELLULAR CONCRETE FILL**

April 3, 2023

**Item 203, Special, Low Density Cellular Concrete Fill**

**Item 840, Special, Low Density Cellular Concrete Fill**

1. **Description**
2. **Qualifications**
3. **Materials**
4. **Mix Design**
5. **Quality Control**
6. **Quality Assurance**
7. **Construction**
8. **Submittals**
9. **Method of Measurement**
10. **Basis of Payment**
11. **Description.** This work consists of furnishing and placing a low density, lightweight, flowable, low absorption, cementitious fill material, referred to as low density cellular concrete fill (LDCCF).
12. **Qualifications.** Provide LDCCF from a Supplier/Producer regularly engaged in the mix design and production of LDCCF material, and placed by a Contractor who has in the past three years completed mass fills having a combined quantity of at least 10,000 total cubic yards.
13. **Materials.** Provide LDCCF material meeting the requirements of this section which has been successfully placed on at least five projects that have performed satisfactorily for at least five years. Furnish the following materials conforming to the referenced requirements:
    1. **Foaming Agent,** conforming to ASTM C796.
    2. **Portland Cement,** conforming to C&MS 701.02, 701.04 or 701.05.
    3. **Water,** conforming to C&MS 499.02.
    4. **Admixtures for Concrete,** conforming to C&MS 705.12 for water reducing, retarding, accelerating, improving the bond, or for other specific properties, when specifically approved by the Supplier/Producer of the LDCCF.

Fly ash Class C or F conforming to C&MS 701.13 and certified per S1026 may be used if it is approved by Supplier/Producer and is compatible with the foaming agent.

1. **Mix Design.** The proposed mix design must meet the properties of Table 1 for the Class of LDCCF specified in the contract documents.

|  |  |  |  |
| --- | --- | --- | --- |
| **Table 1 – LDCCF Properties** | | | |
| **Property** | **Class II** | **Class III** | **Class IV** |
| **Cast Density**1, max | 30 lb/ft3 | 36 lb/ft3 | 42 lb/ft3 |
| **Compressive Strength**2, min, @ 28 days | 40 psi | 80 psi | 120 psi |
| **Water Absorption**, ASTM C796, max 3 | 20 percent | 16 percent | 14 percent |
| 1Specified in Section 6.0 of this specification  2 Modified in Section 6.2 of this specification  3 Expressed as percent of cast density | | | |

1. **Quality Control.** Perform cast density measurements hourly on each day of production. Maintain a log of the cast density measurements.
2. **Quality Assurance.** Quality assurance will be based on the cast density and compressive strength at the point of placement. Any mixes not meeting the requirements in Table 1 for the specified class will be rejected.
   1. **Cast Density.** At a minimum, the Engineer will check one of the batches each day, as follows:
3. Weigh a container of known volume and record the weight. A standard concrete cylinder mold may be used as the container.
4. Fill the container with LDCCF, tapping the container sides briskly with a rubber hammer during filling. Do not rod the sample as is done for concrete testing.
5. Overfill the container, striking off the excess LDCCF. Wipe off the outside surface of the container.
6. Weigh the full container.
7. Subtract the weight of the empty container from the full container.
8. Calculate the cast density and compare it to the maximum density for the Class of LDCCF.

If the LDCCF material exceeds the maximum density for the specified Class, adjust the mix and recheck the cast density.

* 1. **Compressive Strength.** Take at least four (4) test specimens for each 300 cubic yards of LDCCF placed or for each day’s production. Prepare, cure, and test the specimens in accordance with ASTM C796 except as follows:

1. Fill an appropriate 3-inch by 6-inch cylinder mold according to ASTM C796, except strike off the excess LDCCF with a trowel. Do not rod the sample as is done for concrete testing.
2. Cure the filled molds in a curing box.
3. After curing, do not oven dry the specimens that are to be load tested. Air dry the specimens for 1 to 3 days before testing.
4. While specimens may be tested at any age to monitor the compressive strength of the LDCCF, test a minimum of two specimens at 28 days for acceptance.
5. Provide the 28-day test results to the Engineer.
6. **Construction.** Place LDCCF according to the Supplier/Producer’s recommended procedures and as described below.

* 1. **Preparation.** The Engineer will examine the exposed subgrade conditions in the placement areas. Correct unsuitable soil conditions as directed by the Engineer before placing the LDCCF. Properly fix in place position items to be encased in the LDCCF. Coat any aluminum to prevent oxidation from the fresh concrete.
  2. **Weather.** Do not place LDCCF if the subsoil is frozen. When the ambient temperature is less than 32 ºF (0 ºC), follow the Supplier/Producer’s recommendations, which may include using heated mix water or Type III cement. Take precautions to avoid damage to the LDCCF from freezing temperatures according to the Supplier/Producer’s recommendations.
  3. **Mixing and Conveying.** Use job-site mixing and conveying equipment for proportioning, mixing and placing the LDCCF approved by the Supplier/Producer. Mix the materials according to the Supplier/Producer mix design procedures and convey the LDCCF to its final position promptly after mixing. Avoid excessive handling of the LDCCF.
  4. **Placement.** Place in lifts not exceeding 3.0 feet unless approved by the Engineer. Place subsequent lifts after waiting at least 12 hours. Do not place LDCCF in an area with standing water. Place the LDCCF with the final surface finish within 0.1-foot of plan elevation and graded to drain as shown on the plans. The finishing may be executed during placement, or graded afterwards, at the contractor’s discretion. The finish surface shall not exhibit excessive cracking, subject to the Engineer’s approval.

In an MSE wall application, do not place reinforcements at cold joints. Support reinforcements in a level position throughout their length, and keep them at least 6 inches above the previous day’s cold joint.

* 1. **Loading.** Do not apply any load on the LDCCF until it has attained a compressive strength of at least 20 psi.

1. **Submittals.** Provide the following submittals to the Engineer a minimum of 30 days prior to placement of LDCCF for each location for acceptance:
   1. **Resume of Supplier/Producer and Contractor,** showing experience as required in Section 2.0, including qualifications of Contractor’s superintendent and/or foreman.

* 1. **LDCCF Mix Design,** meeting the requirements of Section 4.0, including materials to be used, their sources, and certified test data.
  2. **QC/QA Plan,** identifying the method and frequency of testing in accordance with ASTM C796 and meeting the requirements of Sections 5.0 and 6.0.
  3. **Construction Plan**, with a description of equipment to be used and mixing and placement methods to verify compliance with Section 7.0. Include working drawings.

1. **Method of Measurement.** The Department will measure each class of Low Density Cellular Concrete Fill by the number of cubic yards of material in the final position, acceptably placed, as determined according to C&MS 203.09.
2. **Basis of Payment**. The Department will pay for accepted quantities at the contract price as follows:

**Item Unit Description**

Special Cubic Yard Low Density Cellular Concrete Fill, Class \_\_