

ITEM 09557.31 M - LIGHTWEIGHT STRUCTURAL CONCRETE FILL WITH SEPARATE WEARING SURFACE

DESCRIPTION. This work shall consist of furnishing and placing portland cement lightweight concrete and reinforcing steel to construct superstructure slabs over existing vault decks, as indicated in the plans and proposal.

MATERIALS. Portland cement lightweight concrete shall be manufactured in accordance with the requirements of §501 and the following modifications:

1. It will be the Contractor's responsibility to design a lightweight concrete mixture. The concrete shall be proportioned in accordance with the American Concrete Institute Manual of Concrete Practice, ACI 211.2, Standard Practice for Selecting Proportions for Structural Lightweight Concrete. The concrete shall consist of a homogeneous mixture of cement, fine aggregate, lightweight coarse aggregate, air entraining agent, normal range set-retarding water-reducing admixture, and water to meet the requirements of this specification.
2. The lightweight concrete mixture will achieve an average compression strength of 25.00 MPa, or greater, with no individual cylinder having a compressive strength less than 21.00 MPa.
3. Cement shall be Type 2 meeting the requirements of §701-01. Cement content shall be a minimum of 400 kg/m³.
4. Fine aggregate shall be natural or manufactured meeting the requirements of §703-07.
5. Lightweight coarse aggregate shall meet the requirements of §703-10. Coarse aggregate gradation shall conform to the 19 mm to 4.75 mm (¾ in. to No. 4) size designation in Table 1, ASTM C330.
6. The average dry unit mass of the cured concrete shall range between 1750 kg/m³ minimum to 1850 kg/m³ maximum when tested in accordance with ASTM C567.
7. Stockpiles of lightweight aggregates shall be constructed such that uniform moisture can be maintained throughout the pile. The established stockpiles shall be continuously and uniformly sprinkled with water for eight (8) hours by means of a sprinkler system approved by the Regional Materials Engineer. The occurrence of a steady rain of comparable intensity will permit turning off the sprinkler system at the direction of the Engineer, until the rain ceases. At the end of the wetting period, or after the rain ceases, the stockpiles shall be allowed to drain for a period of twelve (12) to fifteen (15) hours immediately prior to use, unless otherwise determined by the Regional Materials Engineer.

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8. After the materials have been accepted for this work, the Contractor will determine the proportions for concrete and equivalent batch weights.
 - a. The Contractor will determine the proportions on the basis of trial mixes conducted with the materials to be used in the work, in accordance with ACI 211.2, Standard Practice for Selecting Proportions for Structural Lightweight Concrete. The corresponding cement content for each trial batch shall be determined by means of a yield test in accordance with ASTM C138.
 - b. At least one (1) week prior to the lightweight concrete placement the Regional Materials Engineer shall be provided a copy of the trial mix design, trial mix data, and batch weights. The following shall be provided:
 - i. Fine aggregate and coarse aggregate (saturated surface dry condition) content in kg/m^3 .
 - ii. Cement content in kg/m^3 .
 - iii. Water content in kg/m^3 .
 - iv. The dry unit mass in accordance with ASTM C567.
 - v. The 28 day compressive strengths.
 - vi. Batch weights.

The Regional Materials Engineer will approve the batch weights prior to use. These values shall be used to manufacture all lightweight concrete for this project. Since the proportions are designated in terms of aggregates in saturated surface-dry condition, the equivalent batch weights used by the Contractor shall be corrected periodically, to account for changes in the fine aggregate fineness modulus and aggregate moisture contents.

9. Concrete testing shall be in accordance with written procedural directives of the Department except that cylinders for determining compressive strength shall be fabricated and cured in accordance with the procedures outlined in NYS Department of Transportation Materials Method 9.2.

Cylinders will be cast by the Engineer, in sets of two (2) individual cylinders, at a casting frequency of one (1) set for each 50 m^3 , or fraction thereof actually placed. A minimum of one (1) set will represent each day's concrete placement.

10. Additional materials required specifically for use with structural concrete items shall meet the requirements of §557-2.

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CONSTRUCTION DETAILS. All the provisions of §557-3 shall apply with the following modifications:

1. All the provisions of §557-3.01, Concrete Manufacturing and Transporting, shall apply with the following modifications:

a. Slump and air tests will be used as a control measure to maintain a consistency suitable to the work. Slump and air tests shall be performed in accordance with NYS Department of Transportation Materials Method 9.2. Air content shall be determined by the volumetric method described in ASTM C173. Air content and slump placement limits, for lightweight concrete are as follows:

	<u>Minimum</u>	<u>Desired</u>	<u>Maximum</u>
Air Content (Roll-A Meter)	5.0%	6.5%	8.0%
Slump (mm)	----	65-90	100

b. Lightweight coarse aggregate, along with approximately $\frac{1}{2}$ of the total mixing water, shall be introduced into the mixer and mixed for a minimum of 10 minutes. The fine aggregate, admixtures, cement, and remaining mixing water shall then be added, and mixing completed.

c. The Manufacturer of the lightweight aggregate shall supply a service representative at the site for the first two days of lightweight concrete placement operations. The representative shall be responsible to assist the Contractor and the Engineer in the control of lightweight concrete mixing and placement operations.

2. All the provisions of §557-3.06, Handling and Placing shall apply except that pumping will not be permitted under any circumstances. No waivers will be granted.

3. All the provisions of §557-3.12, Curing, shall apply except that only continuous wetting will be allowed.

4. All the provisions of §557-3.13 shall apply. In addition, any concrete, represented by a cylinder set, with an average compressive strength less than 25.00 MPa, or an individual cylinder with a compressive strength less than 21.00 MPa, shall be rejected, and the contractor shall be responsible to provide a

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remediation plan suitable to the Department. Any remediation performed shall be at the contractors expense.

5. All the provisions of §557-3.14, Loading Limitations for Structural Slabs, shall apply except that concrete cylinder sets designated for early loading shall achieve an average compression strength of 25.00 MPa, or greater, with no individual cylinder having a compressive strength less than 21.00 MPa.

METHOD OF MEASUREMENT. Payment will be made for the number of cubic meters within the lines of the structure as shown on the plans. In computing the volume of concrete for payment, no deductions shall be made for the volume of joint material, embedded metal reinforcement, structural shapes, chamfers, or any items with an end area of less than 0.10 m².

BASIS OF PAYMENT. The unit price bid per cubic meter of concrete shall include the cost of furnishing all labor, materials and equipment necessary to complete the concrete work as shown on the plans or called for in the specifications.

The provisions of Subsection 557-5.01 shall apply, except that volume not area shall be used to calculate progress payments.

Payment will be made under:

Item No.	Item	Pay Unit
09557.31 M	Lightweight Structural Concrete Fill with Separate Wearing Surface	Cubic Meter