

## **ITEM 10557.34 M - LIGHTWEIGHT HIGH-PERFORMANCE CONCRETE**

### **DESCRIPTION**

This work shall consist of furnishing and placing portland cement lightweight concrete fill and overfill on the bascule span steel grid deck, as indicated in the plans and as specified herein.

### **MATERIAL REQUIREMENTS**

Use materials meeting §557-2. Perform additional work as follows:

Manufacture lightweight high-performance according to §501, with the following modifications:

1. Design a lightweight high-performance concrete mixture, proportioned according to the American Concrete Institute Manual of Concrete Practice, ACI 211.2, and Standard Practice for Selecting Proportions for Structural Lightweight Concrete. Produce a homogeneous mixture of cement, fly ash, microsilica, fine aggregate, lightweight coarse aggregate, air entraining agent, normal range set-retarding water-reducing admixture, and water as designed.
2. Use Type 2 cement with a minimum cement content of 400 kg/m. Use 15-20% Fly Ash (or GGBFS) and 6-10% microsilica.
3. Use lightweight coarse aggregate conforming to §703-10, with a gradation in the 10 mm to 2.36 mm size designation in Table 1, ASTM C330.
4. Construct lightweight aggregate stockpile(s) so as to maintain uniform moisture throughout the pile. Continuously and uniformly sprinkle the stockpile(s) with water for a minimum of 24 hours using a sprinkler system approved by the Materials Engineer. If a steady rain of comparable intensity occurs, turn off the sprinkler system at the direction of the Materials Engineer, until the rain ceases. At the end of the wetting period, or after the rain ceases, allow stockpiles to drain for 12 to 15 hours immediately prior to use, unless otherwise directed by the Materials Engineer.
5. After the materials have been accepted for this work, determine the proportions for concrete and equivalent batch masses based on trials made with materials to be used in the work.
  - a. Determine the cement content for each trial batch by means of a yield test according to ASTM C138.
  - b. At least 1 week prior to concrete placement, provide the Materials Engineer with a copy of the trial mix design with the following data.
    - i. Fine and coarse aggregate (saturated surface dry condition) content in kg/m<sup>3</sup>.
    - ii. Cement content in kg/m<sup>3</sup>.
    - iii. Water content in kg/m<sup>3</sup>.
    - iv. Dry unit mass in accordance with ASTM C567.
    - v. 28 day compressive strengths.
    - vi. Batch masses.

The Materials Engineer will approve the batch weights prior to use. Use these values to manufacture all lightweight concrete for this project, and periodically correct the batch masses to account for changes in the fine aggregate fineness modulus and aggregate moisture contents.

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- 6. Achieve an average compression strength of 25.00 MPa, or greater, with no individual cylinder compressive strength less than 21.00 MPa.
- 7. Produce concrete with an average dry unit mass ranging from 1750 to 1850 kg/m<sup>3</sup> when tested in accordance with ASTM C567.

**CONSTRUCTION DETAILS**

Apply the provisions of §557-3 and the following modifications:

- 1. Add the following to §557-3.01, Concrete Manufacturing and Transporting:
  - a. Use slump and air tests as a control measure to maintain a suitable consistency. Perform slump and air tests according to NYSDOT Materials Method 9.2. Determine air content by the volumetric method described in ASTM C173. Air content and slump placement limits are:

	<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. If the lightweight coarse aggregate moisture content at the time of batching is less than saturated surface dry (SSD), introduce lightweight coarse aggregate, along with approximately 2/3 of the total mixing water, into the mixer and mix for a minimum of 10 minutes. Otherwise, batch the coarse aggregate routinely with the fine aggregate, admixtures, cement, fly ash, microsilica, and remaining mixing water and mix completely.
  - c. Have the lightweight aggregate manufacturer supply a service representative at the site for the first two days of lightweight concrete placement operations to assist in the control of lightweight concrete mixing and placement operations.

Handle and place concrete according to §557-3.06, Handling and Placing, except that pumping is not permitted. No waivers will be granted. Insert concrete vibrators deeper at full depth areas.

During concrete placement, wash off any mortar that leaks through the steel grid panels and drips onto any structural steel.

- 2. Test the concrete according to written Department procedural directives. Fabricate and cure cylinders for compressive strength testing according to NYSDOT Materials Method 9.2 procedures. The Engineer will cast cylinders, in sets of 2 individual cylinders, at a frequency of 1 set for each 50 m<sup>3</sup>, or fraction thereof actually placed. A minimum of 1 set will represent each day's concrete placement.
- 3. Cure concrete according to §557-3.12, Curing, except that only continuous wetting is allowed.
- 4. Make any repairs as per the provisions of §557-3.13, Damaged or Defective Concrete. In addition, the Engineer will reject 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. Proposed repairs require Deputy Chief Engineer, Structures approval.

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5. The loading limitations of §557-3.14 apply, except that concrete cylinder sets designated for early loading must attain an average compression strength of 25.00 MPA, or greater, with no individual cylinder less than 21.00 MPa.

### **METHOD OF MEASUREMENT**

Payment will be made at the unit price bid per square meter for the number of square meters of bascule span deck stated in the Estimate of Quantities shown on the contract plans.

### **BASIS OF PAYMENT**

The unit price bid per square meter shall include the cost of furnishing all labor, materials and equipment necessary to complete the work as shown on the plans or called for in the specification.