

**ITEM 06569.30 M - LIGHTWEIGHT HIGH-PERFORMANCE CONCRETE
BRIDGE BARRIER**

DESCRIPTION.

Furnish and place reinforcing steel and lightweight high-performance concrete to construct concrete bridge barrier as shown in the contract plans. Precast barrier will not be allowed.

MATERIALS.

Use materials meeting §569-2. Perform additional work as follows:

Manufacture lightweight high-performance concrete according to §501, and 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, 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. Use a minimum cementitious content of 360 kg/m³. Use 15-20% pozzolan and 6-10% microsilica.
3. Use lightweight coarse aggregate conforming to §703-10, with a gradation in the 25mm to 4.75 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/m³.
 - ii. Cement content in kg/m³.

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- iii. Water content in kg/m³.
- 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.

- 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/m³ when tested in accordance with ASTM C567.

CONSTRUCTION DETAILS.

Apply the provisions of §569-3 and the following modifications:

- 1. Install epoxy coated reinforcing steel and Uncoated Bar Reinforcement for Concrete Structures in accordance with Section 556 - Reinforcing Steel for Concrete Structures and as shown on the plans.
- 2. Add the following to §555-3.01, 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 (Volumetric Method) | | 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 $\frac{2}{3}$ 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.

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- 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.
3. Handle and place concrete according to §555-3.04, Handling and Placing, except that pumping is not permitted. No waivers will be granted.

The existing concrete surface shall be continuously and thoroughly wetted for 12 hours prior to placing concrete.

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 m³, or fraction thereof actually placed. A minimum of 1 set will represent each day's concrete placement.

4. All damaged or defective concrete shall be repaired or replaced at the Contractor's expense. Damage or defects are defined as, but not limited to, spalling, irregular cracking, tearing, honeycombing, scaling, surface imperfections or irregularities, and lack of smoothness. After the concrete has hardened, the Engineer will examine it for damage as appropriate. Using the Contractor's straight edge surface irregularities and smoothness requirements will be checked. Surface irregularities greater than 5 millimeters in 3 meters shall be corrected in a manner acceptable to the Department.

Repairs to remove excess concrete or irregularities shall be performed using methods and equipment that does not damage the concrete to remain. Further, removal of concrete shall be performed to maintain the appropriate cover of reinforcement.

Repairs to remove and replace damaged or defective concrete shall be performed by making all repair areas rectangular in shape and as close to square as possible. Sawcut the perimeter of the repair area to a depth of 20 millimeters ± 3 millimeters. Chip out concrete, using chisel bits only, to a uniform level, removing all damaged or defective concrete. Angle the walls of the repair area at 45° toward the center of the repair, from the bottom of the perimeter sawcut. Do not undercut existing concrete. Surface preparation, placement, and curing of the repair concrete shall be in accordance with specifications and Department directives for the material used.

Unless otherwise directed by the Regional Materials Engineer, the concrete used for repairs shall be of the same materials as that used for the original placement. Small repair areas may be repaired with concrete repair materials appearing on the Department's Approved List providing the repair materials have similar characteristics as the original concrete.

5. The Engineer will reject any concrete represented by a cylinder set with an average

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compressive strength less than 25.00 MPa, or an individual cylinder with a compressive strength less than 21.00 MPa.

METHOD OF MEASUREMENT.

Payment will be made at the unit price bid per meter for the number of meters of bridge barrier installed. Measurement will be taken along the centerline of the top of the barrier. No deductions will be made for joints.

BASIS OF PAYMENT.

Include the cost of all labor, materials and equipment necessary to complete the work in the bid price.

Progress payments will be made on a per span basis as follows:

1. 40 percent of the estimate area after all reinforcing is properly placed.
2. 40 percent of the estimate area after concrete placement, and curing initiated.
3. The remainder after curing and necessary corrective work is complete.