

ITEM 606.9001 - - 11M TRANSITION BETWEEN BOX BEAM GUIDE RAIL AND SINGLE SLOPE HALF SECTION LIGHTWEIGHT HIGH- PERFORMANCE CONCRETE BARRIER (ONE OR TWO WAY OPERATION)

ITEM 606.9002 - - 11M TRANSITION BETWEEN WIDE AND NORMAL SINGLE SLOPE LIGHTWEIGHT HIGH PERFORMANCE CONCRETE MEDIAN BARRIER

ITEM 606.9003 - - 11M TRANSITION BETWEEN STANDARD (NJ) CONCRETE BARRIER AND SINGLE SLOPE LIGHTWEIGHT HIGH PERFORMANCE CONCRETE BARRIER

DESCRIPTION

This work shall consist of the construction of Lightweight, high performance concrete highway barrier systems and component parts in accordance with the specifications, standard sheets, manufacturer's drawings, manufacturer's directions and contract documents to the lines and grades shown on the plans or established by the Engineer.

MATERIALS

Use materials meeting §606-2. Manufacture lightweight high-performance concrete according to §501 and the following modifications:

A. Design. 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.

1. 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 II cement (§701.01). Use a minimum cementitious content of 360 kg/m³. Use 15-20% pozzolan (§711-10, Flyash or §711-12, GGBFS), and 6-10% microsilica (§711-11).
3. Use lightweight coarse aggregate conforming to §703-10, with a gradation in the 25 mm to 4.75 mm size designation in Table 1, ASTM C330.
4. Determine the cement content for each trial batch by means of a yield test according to ASTM C138.
 - a. At least 10 working days prior to concrete placement, provide the Materials Engineer with a copy of the trial mix design with the following data:
 - Fine and coarse aggregate (saturated, surface dry condition) content in Kg/m³.
 - Cementitious content in kg/m³.
 - Water content in kg/m³.
 - Unit mass of freshly mixed concrete in accordance with ASTM C138.
 - Dry unit mass in accordance with ASTM C567.
 - 28-day compressive strengths.
 - Batch quantities of all materials as they will appear on the batch record.
 - b. The Materials Engineer, or their representative, will approve the batch quantities 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 in accordance with Materials Method 9.1, or current Department directives.

B. Stockpile Handling. Construct lightweight coarse aggregate stockpile(s) at the production facility so as

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to maintain uniform moisture throughout the pile. Continuously and uniformly sprinkle the stockpile(s) with water, using a sprinkler system approved by the Materials Engineer. Soak for a minimum of 48 hours, or until the stockpile has achieved a minimum internal moisture content of 15% by weight. If a steady rain of comparable intensity occurs, turn off the sprinkler system. If the rain ceases prior to the end of the wetting period, restart the sprinkling system. At the end of the wetting period, or when a rainfall ceases beyond the end of the wetting period, allow stockpiles to drain for 12 to 15 hours immediately prior to use.

C. Batching. 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.

D. Compressive Strength Determination. Achieve an average 28-day compressive strength of 25 MPa, or greater, with no individual cylinder compressive strength less than 21 MPa.

E. Density Determination. 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 §606-3 and the following modifications:

1. Construction of the barrier shall be accomplished by cast-in-place only. Precast barrier will not be allowed.
2. **Concrete Manufacturing and Transporting.** Add the following to §555-3.01
 - 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:

	Minimum	Desired	Maximum
Air Content (%)	5.0	6.5	8.0
Slump (mm)	65	65-90	100

B. If the lightweight coarse aggregate moisture content at the time of batching is less than saturated surface dry (SSD), introduce the lightweight coarse aggregate, along with approximately 2/3 of the total mixing water, into the mixer and mix for a minimum of 10 minutes, then continue batching the remaining ingredients. If the coarse aggregate is in an SSD condition, batch the coarse aggregate routinely with the fine aggregate, admixtures, cement, Fly ash (or GGBFS), microsilica, and mixing water, then mix completely.

C. Have the lightweight aggregate manufacturer supply a service representative at the site for the first two days of concrete placement operations to assist in the control of lightweight concrete

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mixing and placement.

3. **Handling, Placing and Finishing.** 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.

4. **Testing.** Test the concrete according to Materials Method 9.2. The unit mass of the fresh concrete during placement should be compared to that which was submitted with trial mix design. Make adjustments to the concrete mix at the batching facility based on slump, unit mass and air tests. 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
5. **Curing.** Cure the concrete according to §555-3.08, except that only continuous wetting is allowed. When permission is granted in writing by the Regional Construction Engineer for cold-weather concreting between September 15th and April 1st, curing temperatures shall be maintained in accordance with §555-3.08C Provisions for Curing in Cold Weather. Failure to maintain acceptable curing conditions, shall result in all concrete of the placement being considered damaged or defective and shall be cause for rejection of all concrete of the represented placement.

Acceptance may be established based on contractor evaluation and testing as directed by the Department, at no additional cost to the State.

6. **Repairs.** 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.

A. 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.

B. 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.

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- C. 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.
7. 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.

METHOD OF MEASUREMENT

Box Beam Guide Rail Transition to Concrete Barrier. Measurement will be taken as the actual number of transition units installed in accordance with the specifications, plans and standard sheets.

Transition between Concrete Sections. Transitions will be measured by the actual number of units installed in accordance with the plans, standard sheets and/or as directed by the Engineer.

BASIS OF PAYMENT

Box Beam Guide Rail Transition to Concrete Barrier. The unit price bid per guide rail transition shall include the cost of all labor, equipment, and material necessary to satisfactorily complete the work, including back-up posts, necessary rail curvature, splices, connections and hardware.

Transition between Concrete Sections. The unit price bid per concrete transition shall include the cost of all labor, equipment, and material necessary to satisfactorily complete the work, including back-up posts, connections and hardware.