

**ITEM 557.5102 05 - 35 MPa INTERNAL CURING CONCRETE FOR SUPERSTRUCTURE
SLAB WITH ITEGRAL PIER CAP -TYPE 02 FRICTION**

DESCRIPTION.

Furnish and place 35 MPa concrete to construct superstructure slabs and integral pier caps as shown in the contract plans. 35 MPa concrete is a modified Class HP concrete with lightweight fine aggregate substituted for a portion of the standard fine aggregate and designed to attain strength of 35 MPa.

MATERIALS.

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

Manufacture 35 MPA concrete, with lightweight fine aggregate according to §501, and the following modifications:

1. Design a concrete mixture with lightweight fine aggregate, proportioned according to the American Concrete Institute Manual of Concrete Practice, ACI 211.2, Standard Practice for Selecting Proportions for Structural Lightweight Concrete, that will achieve a minimum compressive strength of 35 MPa at 28 curing days. Produce a homogeneous mixture of cement, pozzolan (fly ash or GGBFS), microsilica, fine aggregate, lightweight fine aggregate, coarse aggregate, air entraining agent, water-reducing and set-retarding admixture, and water as designed.
2. Use Type I, I/II, II or Type SF cement. Use a minimum total cementitious content of 400 kg/m³. Use 15-20% pozzolan (fly ash or GGBFS) and 6-10% microsilica.*

*If Type SF Blended cement is used, the separate addition of Microsilica is not required.
3. Substitute lightweight fine aggregate, meeting the requirements of AASHTO M 195, for 30% (by volume) of standard fine aggregate.
4. Construct lightweight fine aggregate stockpile(s) at the production facility 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. Make appropriate adjustments to the specific gravity (Bulk SSD) and fineness modulus of the combined fine aggregate when developing the mix design.

At least 1 week prior to concrete placement, provide the Materials Engineer with a copy of the trial mix design with the following data:

- a. Fine and coarse aggregate (saturated, surface dry condition) content in kg/m³.*
- b. Cementitious content in kg/m³.
- c. Water content in kg/m³.
- d. 28-day compressive strengths.
- e. Batch masses.

*The moisture content of the lightweight fine aggregate must be determined immediately prior to batching, using Materials Procedure 703-19E. If the supplied mix design is based on "oven dry" mass of lightweight fine aggregate, a corresponding adjusted mass must be supplied to account for the actual absorbed moisture content, so that the mix design entered

into the automated batching system is based on SSD mass. After the adjusted mix design is entered into the batching system, additional adjustments must be made to the fine aggregate and water quantities to account for the surface moisture of the fine aggregates.

The Materials Engineer, or his representative, will approve the batch weights prior to use. Use these values to manufacture all high performance concrete with lightweight fine aggregate 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 28-day compression strength of 35 MPa, or greater, with no individual cylinder compressive strength less than 31 MPa.

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. The lightweight fine aggregate moisture content at the time of batching must be a minimum of saturated surface dry (SSD). Batch the lightweight fine aggregate first, then routinely batch the fine aggregate, coarse aggregate, admixtures, cement, pozzolan, microsilica, and remaining mixing water and mix completely.
 - b. 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 concrete mixing and placement operations.
2. Sampling of concrete during the placement procedures shall be in accordance with NYSDOT Materials Method 9.2.
3. The Engineer will cast cylinders, in sets of 2 individual cylinders, at a frequency of 3 sets for each 50 m³ of concrete, or fraction thereof actually placed. A minimum of 9 cylinder sets, representing 3 different batches, will be cast for each day's concrete placement. One cylinder set shall be cast from the initial batch of concrete delivered and accepted at the project site.
4. All cylinders cast under the sampling program shall be cured in the same manner, and under the same conditions as the placement they represent.

Cylinders shall be tested for compressive strength, to determine appropriate timing for post tensioning and to address early loading, according to the following schedule:

- a. At seven curing days.
- b. At fourteen curing days.
- c. At twenty-eight curing days.

A curing day is defined by subsection §555.3.08A.

5. The strength level of the concrete will be considered acceptable provided the compressive strengths of the tested cylinders meet the following values:
 - a. 21 MPa average strength at the time of post tensioning of the pier cap, with no individual cylinder testing results below 20 MPa.
 - b. 35 MPa average strength at twenty-eight curing days with no individual cylinder testing results below 31 MPa.
6. Concrete represented by cylinders averaging less than 35 MPa, and cores averaging less than

30 MPa will be subject to rejection and shall be removed upon the orders of the Engineer.

7. The loading limitations of §557-3.14 apply, except that concrete cylinder sets designated for early loading must attain an average compression strength of 35 MPa, or greater, with no individual cylinder less than 31 MPa.
8. Make any repairs as per the provisions of §557-3.16, Damaged or Defective Concrete. The Engineer will reject any concrete represented by a 28-day cylinder set with an average compressive strength less than 35 MPa, or an individual cylinder with a compressive strength less than 31 MPa. Proposed repairs require Deputy Chief Engineer, Structures approval.

METHOD OF MEASUREMENT.

The work will be measured for payment as the number of cubic meters of concrete satisfactorily installed, measured to the nearest 0.1 cubic meter.

BASIS OF PAYMENT.

The unit price bid per cubic meter shall include the cost of furnishing all labor, materials, and equipment necessary to complete the work, except that reinforcement will be paid for under its own item.