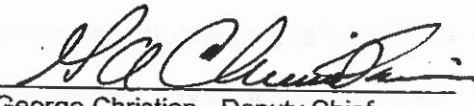


To: SUPERSEDED BY <u>EB 06-057</u> EFFECTIVE <u>5/3/07</u> MODIFIED BY <u>EB 03-065</u> EFFECTIVE <u>11/25/03</u>		New York State Department of Transportation ENGINEERING INSTRUCTION	EI 03-037
Title: HIGH PERFORMANCE CONCRETE FOR PRECAST AND PRESTRESSED BRIDGE BEAMS			
Distribution: ☒ Manufacturers (18) ☐ Surveyors (33) ☒ Main Office (30) ☒ Consultants (34) ☒ Local Govt. (31) ☒ Contractors (39) ☒ Regions/Agencies (32) ☐ _____ ()		Approved:  George Christian - Deputy Chief Engineer (Structures) <u>10/27/03</u> Date	

ADMINISTRATIVE INFORMATION:

- This EI is effective with projects submitted for the letting of May 6, 2004.
- This EI does not supersede any other EI or EB.
- The Standard Specification revisions issued with this EI will be incorporated into the next issuance of the Standard Specifications.
- Special Specifications 16563.0299 M, 16563.60 M, 16563.61 M, 16563.62 M, 16563.63 M, and 16563.64 M are disapproved.

PURPOSE:

This EI adds Section 718-06 to the Standard Specifications of January 2, 2002.

TECHNICAL INFORMATION:

High Performance Concrete For Precast and Prestressed Bridge Beams will be the standard concrete for Prestressed Concrete Units (Structural). With this change, the minimum concrete strength of Prestressed Concrete Units (Structural) will be 70 MPa.

TRANSMITTED MATERIALS:

Shelf Note for revisions to the January 2, 2002, Standard Specifications.

BACKGROUND:

The specification for High Performance Concrete for Prestressed Concrete Girders has been used successfully to build more than twenty bridges. Bid prices for the High Performance Concrete have been comparable to bid prices for standard concrete. The improved durability of this material and the increased strength make it possible to build longer lasting bridges without an increase in cost. In some cases, the increased strength makes it possible to decrease girder size or reduce the number of girders, resulting in a cost savings.

The disapproved special specifications were used for the High Performance Concrete bridges that have been built to date. The standard specification replaces these special specifications.

CONTACT:

Direct questions regarding this EI to Duane Carpenter of the Structures Design and Construction Division at 518-457-5715 or via e-mail at dcarpenter@dot.state.ny.us.

Make the following changes to Volume 2 of 3 of the Standard Specifications of January 2, 2002:

Page 5-97, add the following after line 10:

"563-2.05 Concrete. The concrete shall meet the requirements of §718-06, High Performance Concrete For Precast and Prestressed Bridge Beams."

Make the following changes to Volume 3 of 3 of the Standard Specifications of January 2, 2002:

Page 7-204, replace line 20 with the following:

718-06 High Performance Concrete For Precast and Prestressed Bridge Beams

SCOPE. This specification covers the material requirements for high performance concrete for precast and prestressed bridge beams.

MATERIAL REQUIREMENTS. The concrete shall meet the requirements of the approved Mix Design Sheet, described below, and the PCCM. The concrete mix shall contain a minimum of 5% microsilica measured as a percent of the total cementitious material.

MIX DESIGN SHEETS (MDS). These sheets shall contain all the information on the mix design, materials, material sources, production facilities, quality control, curing, and preproduction testing of the mix. Once approved for production, the MDS may be used in any contract requiring high performance concrete for precast and prestressed bridge beams.

The MDS will have a two-step approval process. The first submittal shall contain all the information required in A. through N. Complete submittals that meet the specification requirements will be examined according to Section 2.5 of the PCCM and, if found acceptable, it will be returned with the notation "APPROVED FOR TESTING." Section 2.5.7 of the PCCM does not apply.

Following required testing of the mix, the MDS shall be submitted to the D.C.E.S. with the information in O. through Q. added to the sheet. If the test results meet the requirements of this specification, the MDS will be returned with the notation "APPROVED." After approval for production, no changes in materials sources, production, curing, or mix design shall be made, except those changes necessitated by a change in the fineness modulus of the aggregate.

If changes are required after the approval of the MDS, a revised MDS with all the required changes shall be submitted to the D.C.E.S. After examining the revised MDS, the D.C.E.S. will determine if repetition of any testing is required for the approval of the revised MDS. If it is determined that some or all tests shall be repeated, the revised MDS will be returned marked up, specifying the required tests to be repeated and stamped "APPROVED FOR TESTING." Remaining portions of the approval process will exactly follow the procedure used for the initial approval of the MDS except that the tests to be performed will be limited to the tests to be repeated marked up by the D.C.E.S.

If it is determined that there is no need for repeating the preproduction testing and if the proposed changes are acceptable to the D.C.E.S., the revised MDS will be approved and returned.

Information Required on MDS. The MDS shall include the following information:

- A. The source and type of cement.
- B. The specific source of the coarse aggregate.
- C. The specific source of the fine aggregate and the fineness modulus of the material proposed for use in the preproduction testing.
- D. The brand and type of all admixtures that will be used.
- E. The complete mix design including all ingredient and quantities proposed for the production concrete.
- F. The maximum water-to-total-cementitious-material ratio that is proposed for production.
- G. Description of the concrete batching and mixing facilities, including the date of last annual inspection and date of last scale calibration check.

- H. Description of the concrete transport equipment.
- I. The method of concrete placement.
- J. Outline of the curing procedure to be used for the production units and test samples.
- K. Quality control tests and procedures that the fabricator will perform.
- L. Detailed description of the preproduction testing procedure to establish that concrete made from the proposed mix design meets the required performance criteria.
- M. The name and address of the testing laboratory(s) conducting the tests.
- N. A fabricator selected identifier for the mix.
- O. Test results for the preproduction test mix.
- P. Actual fineness modulus of the fine aggregate used in the preproduction test mix.
- Q. Graph of compressive strength versus age.

TESTING. The concrete mix design shall be tested prior to making any bridge beams and shall meet the following performance criteria.

TABLE 718-06-1 TESTING REQUIREMENTS FOR HP CONCRETE		
PROPERTY	TEST METHOD	ACCEPTANCE CRITERIA
Compressive Strength (at 56 days)	AASHTO T22	$> 70\text{MPa}$ (all tests)
Freeze/Thaw Durability (x=relative dynamic modulus of elasticity after 300 cycles)	AASHTO T161 Procedure A	$x \geq 80\%$
Scaling Resistance (y= visual rating of surface after 50 cycles)	ASTM C672	$y \leq 3$
Elasticity (E = modulus of elasticity)	ASTM C469 (See Note C)	$E \geq 30\text{GPa}$
Shrinkage (s= microstrain)	AASHTO T160-97 (at 56 days)	$s < 600$
Creep (c = microstrain/pressure unit)	ASTM C512 (at 56 days, 40% f'_c)	$c \leq 60/\text{MPa}$
Chloride Penetration (p= increase in percent of chloride ion by weight of concrete)	AASHTO T259 modified (See Note A)	$p \leq 0.025\%$ at 25 mm
Air Content	AASHTO T 152	A = % selected by contractor, $A \geq 3\%$
Water/Cementitious-Materials ratio (W= mass ratio)	AASHTO TP23-93 (See Note B)	Supplier selects W, $W < 0.40$

Note A: The test specimens are to be cured under the same conditions and for the same time as proposed for production. They shall then be stored for 28 days in the drying room specified by the AASHTO T259.

Note B: The AASHTO TP23 test shall be corrected for the absorbed water in the aggregate. This correction shall be made using the mass percentage of absorption shown under "ABS" in the Approved List of Sources of Fine and Coarse Aggregates (or as determined by AASHTO T-84 for fine aggregates and AASHTO T-85 for coarse aggregate) by an A.A.S.H.T.O. accredited testing laboratory.

Note C: Test two samples. Each sample is to be loaded at 40% of the load required to break a companion sample cast from the same mix at the same time as the test sample. Sample 1 is to be loaded when the strength of a companion sample achieves a strength of $49 \text{ MPa} \pm 3 \text{ MPa}$. Sample 2 is to be loaded when the strength of a companion sample achieves a strength of $70 \text{ MPa} \pm 5 \text{ MPa}$.

PREPRODUCTION TESTING

The Contractor shall engage an A.A.S.H.T.O. Accredited testing laboratory for testing of all preproduction concrete specimens except compressive strength, air content, and water/cementitious-materials ratio. These tests shall be performed in the presence of the Quality Assurance (QA) Inspector. The D.C.E.S. may approve laboratories with equivalent certification from another organization. The testing laboratory shall send a copy of the test results directly to the D.C.E.S.

The Contractor shall notify the Department at least three work days prior to casting preproduction test specimens. No test specimens shall be cast unless the QA Inspector is present to witness the mixing, casting, and curing of the specimens. The test specimens shall be prepared of concrete made using materials from sources shown on the "Approved For Testing" MDS.

The water-to-total-cementitious-materials ratio for concrete mix for purposes of preparing specimens for chloride penetration testing shall be 0.03 higher than the maximum water-to-total-cementitious-materials ratio that is proposed for production. In addition to those specimens needed for AASHTO T259 testing, the fabricator shall cast eighteen 100 mm x 200 mm cylinders from the chloride penetration test mix, cure the cylinders in accordance with the approved production curing procedures for long-term independent testing and research. These cylinders shall be delivered to the testing laboratory designated by the D.C.E.S.

The test mix for all other tests shall be the water-to-total-cementitious-materials ratio that is proposed for production within a tolerance of 0.01. Include the total aggregate moisture, as determined according to AASHTO T 255, in the calculation of the water-to-total-cementitious-materials ratio with appropriate adjustments. (See Note B in Material Requirements.)

Using the test mix, cast and test compressive strength cylinders at 18 hours, 3 days, 7 days, 28 days, and 56 days. Present the test results in a graph.

Acceptance of Test Specimens. All test specimens shall be prepared in accordance with an "Approved for Testing" MDS. The preparation, casting, and curing of the test specimens shall be done in the presence of the QA Inspector. The QA Inspector shall indicate the procedures on the MDS were followed by affixing the inspection agency stamp on the samples prior to shipping to the Independent Testing Laboratories.

FABRICATION. The requirements of the PCCM shall apply with the following modifications:

1. Submitted Shop Drawings shall include approved Mix Design Sheets.
2. The required 56-day strength is 70 MPa, unless shown otherwise in the Contract Documents.
3. The required minimum strength for imparting prestressing force into the concrete is 49 MPa unless shown otherwise in the Contract Documents.
4. The fineness modulus of the fine aggregate shall not vary more than 0.2 from the actual fineness modulus used in the preproduction test mix.
5. Water/Cementitious-materials ratio shall be measured by the Fabricator for the first batch of concrete in a day's placement and monitored by slump tests throughout production. If the QA Inspector has reason to believe the water/cementitious-materials ratio is changing, or if the slump increases by more than the allowed increase in the table below, additional water/cementitious-materials ratio tests may be ordered.

Slump of First Batch	Allowed Increase
Less than 100 mm	25 mm
100 mm or more	37 mm

6. Batch tickets shall be provided to the Inspector to verify the concrete mix contents.

BASIS OF ACCEPTANCE. Units will be considered for acceptance at the manufacturing location in accordance with the PCCM.

718-07 THRU 718-29 (VACANT)