

707-B-318 PRECAST AND PRECAST PRESTRESSED CONCRETE STRUCTURAL MEMBERS

(Revised 09-15-22)

The Standard Specifications are revised as follows:

SECTION 707, BEGIN LINE 22, DELETE AND INSERT AS FOLLOWS:

Fly Ash	901.02
Ground Granulated Blast Furnace Slag	901.03
Non-Epoxy PCC Sealers	909.10
PCC Sealer/Healer	901.06
Portland Cement.....	901.01(b)
Reinforcing Bars <i>and WWR</i>	910.01
<i>Slag Cement</i>	<i>901.03</i>
Silica Fume	901.04
Uncoated Seven-Wire Strand.....	910.01(b)7

SECTION 707, BEGIN LINE 47, DELETE AND INSERT AS FOLLOWS:

707.03 General Requirements

Dimensions and design requirements for structural members shall be as shown on the plans. Lengths and dimension tolerances shall be as shown on the plans or as otherwise specified. A beam which is to include a field attached curb shall have curb reinforcement located longitudinally within 3/4 in. of the locations shown on the plans. ~~If detailed drawings are not included in the plans, w~~Working drawings shall be submitted for approval in accordance with 105.02. Certified mill test reports shall be furnished for all uncoated seven-wire strands.

SECTION 707, BEGIN LINE 118, DELETE AND INSERT AS FOLLOWS:

(c) Concrete

Concrete shall be air entrained and ~~in accordance with the applicable requirements of 702.05. The concrete~~ shall have a minimum temperature of 50°F and a maximum temperature of 90°F at the time of placement. *Concrete, herein referred to as conventional concrete, or self-consolidating concrete as specified below, shall be in accordance with the applicable requirements of 702.05.* When a chemical admixture type A, D, F, or G is used, it shall be used in combination with an air entraining admixture. A high range water reducing, HRWR, or high range water reducing retarding, HRWRR, admixture system may be used. Chemical admixture types B, C, and E will only be allowed with prior written permission. *Chemical admixture type C and portland cement type III shall not be used in the same concrete mixture.* Air-entraining cement will not be allowed. The cement content of the mixed concrete shall be sufficient to obtain the specified minimum 28-day compressive strength. The total of portland cement and other cementitious materials shall be a minimum of 564 lb/cu yd and shall not exceed ~~800~~820 lb/cu yd. Silica fume may be added in an amount not to exceed 5% of the total cementitious material.

When a type A, D, or E admixture is not used, or if a type B or C chemical admixture is used, slump shall be no less than 1 in. or more than 3 in. When concrete admixtures type A, D, or E is used, slump shall be no less than 2 in. or more than 5 in. When concrete containing admixture type F, G, or admixture systems is used, the concrete shall have a slump no less than 3 in. or more than 8 in. The amount of time from mixing to placement and consolidation shall be a maximum of 30 minutes. The concrete shall not be

retempered with additional amounts of chemical admixture types F or G after the initial mixing has been completed.

1. Self-Consolidating Concrete, SCC

SCC may be used in precast prestressed structural members. The proposed mix design shall be submitted to the DTE a minimum of 14 days prior to the trial batch. SCC shall be included in the producer's QCP. A copy of the QCP shall be included with the mix design. The QCP shall describe the producer's method to ensure consistent quality for all batches by addressing the following:

- a. All pertinent specification requirements and target properties for both plastic and hardened SCC. This shall include testing frequencies.*
- b. Production procedures and testing to ensure the initial batch of SCC is of adequate quality.*
- c. Production procedures and testing to ensure that subsequent batches of SCC are of adequate quality.*
- d. SCC is intended to flow and consolidate under its own mass. Production procedures shall include details of the use of any vibration.*

The absolute volume of the mix design shall be 27.0 cu ft per cu yd and shall meet the criteria in 707.04(c) and the following:

<i>SCC Properties</i>		
<i>Physical Test</i>	<i>Specification</i>	<i>Requirement</i>
<i>Slump Flow</i>	<i>ASTM C1611</i>	<i>Design: 22 in. to 28 in. Tolerance: ± 2 in.</i>
<i>Visual Stability Index (VSI)</i>	<i>ASTM C1611</i>	<i>0 or 1</i>
<i>Relative Viscosity, T_{50}</i>	<i>ASTM C1611</i>	<i>$2 \text{ sec} \leq T_{50} \leq 7 \text{ sec}$</i>
<i>J-Ring</i>	<i>ASTM C1621</i>	<i>Difference between the slump flow and J-ring flow must be ≤ 2 in.</i>
<i>Static Segregation</i>	<i>ASTM C1712</i>	<i>$\leq 1/2$ in.</i>
<i>Column Segregation</i>	<i>ASTM C1610</i>	<i>$\leq 12\%$</i>
<i>Water-cement ratio, max.</i>	<i>ITM 403</i>	<i>0.44</i>

A trial batch of the proposed SCC mix design shall be conducted. All tests in the table above shall be performed. The SCC shall also be tested for air content and yield.

If the mix is to be used without surface sealing in accordance with 707.06, an SCC block 10 in. by 24 in. by 54 in. shall be cast. The block shall be formed and cast inside a water tank. After the SCC has set, the tank shall be filled with lime water covering the top of the block and wood form. The SCC shall be cured in water for 28 days. After a minimum of 28 days the SCC shall be cored. A minimum of 10 cores shall be cut. The cores shall be 4 in. outside diameter and the full depth of the block. The cores will be evaluated by the

Department for absorption in accordance with ASTM C1585 and bulk resistivity in accordance with ASTM C1876 as follows:

<i>SCC Properties for Low Permeability</i>		
<i>Physical Test</i>	<i>Specification</i>	<i>Requirement</i>
<i>Absorption rates, max.</i>	<i>ASTM C1585</i>	<i>7.0 x 10⁻³ mm/s² (Initial) 1.5 x 10⁻³ mm/s² (Secondary)</i>
<i>Absorption, max.</i>	<i>ASTM C1585</i>	<i>1.5 mm (Initial) 3.0 mm (Secondary)</i>
<i>Resistivity, min.</i>	<i>ASTM C1876</i>	<i>130 Ohm-m</i>

12. Cold Weather Concrete

Cold weather concrete shall be in accordance with 702.11.

23. Hot Weather Concrete

When it is necessary to fabricate concrete structural members during times of hot weather the mix water may be chilled or an appropriate amount of ice may be added to the concrete mix in order to produce concrete of the temperature specified herein.

34. Acceptance Testing

Acceptance of precast and precast, prestressed structural members will be based on ~~the following tests for slump, air content, and compressive strength in accordance with the Frequency Manual. All slump, air content, and compressive strength tests shall be performed in the presence of the Engineer. For conventional concrete slump, and air content, and compressive strength tests measurements shall be obtained each time cylinders are made performed. Compressive strengths of the structural members shall be determined from cylinder sets described herein. The 28 day compressive strength shall be equal to or greater than the specified concrete compressive strength. The compressive strength of the concrete for each structural member will be determined from the average strength of the cylinder set representing that member. No individual strength within a cylinder set representing a structural member shall be less than 90% of the specified concrete compressive strength. For SCC slump flow, air content, relative viscosity, visual stability index, and compressive strength tests shall be performed.~~

Compressive strengths of the structural members shall be determined from cylinder sets described herein. The 28-day compressive strength shall be equal to or greater than the specified concrete compressive strength. The compressive strength of the concrete for each structural member will be determined from the average strength of the cylinder set representing that member. No individual strength within a cylinder set representing a structural member shall be less than 90% of the specified concrete compressive strength.

All molds, facilities, labor, and materials necessary to prepare, cure, and test the cylinder sets shall be furnished.

a. Cylinder Set

A cylinder set shall consist of ~~at least three cylinders obtained from three separate batches or loads of concrete used in casting a structural member~~ *one cylinder from each set of tests taken in accordance with the Frequency Manual.* The batches or loads to be sampled may be as directed by the Engineer. All cylinders for acceptance shall be 6 in.

diameter by 12 in., or 4 in. diameter by 8 in., molded and field cured in accordance with ASTM C31. The Contractor may make additional cylinder sets for use in acceptance testing. *If 4 in. diameter by 8 in. cylinders are used, cylinder strengths shall be multiplied by a reduction factor as follows:*

<i>Strength Reduction Factor for 4 in. diameter by 8 in. cylinders</i>	
<i>Cylinder Age</i>	<i>Reduction Factor</i>
$\leq 48 h$	0.97
$> 48 h$	0.94

SECTION 707, BEGIN LINE 193, DELETE AND INSERT AS FOLLOWS:

b. Precast, Non-Prestressed Structural Members

When fabricating precast, non-prestressed structural members, ~~a minimum of one cylinder set shall be made per member cast~~ *the number of cylinder sets shall be cast in accordance with the Frequency Manual.* The 28-day compressive strength of the concrete for each structural member will be determined by the average strength of the cylinder set representing that member. The fabricator may elect to make additional cylinder sets for use in acceptance testing prior to 28 days.

c. Precast, Prestressed Structural Members

~~A minimum of two cylinder sets shall be made for each structural member cast~~ *Cylinder sets shall be cast in accordance with the Frequency Manual.* One cylinder set shall be tested and used to determine when the precast, prestressed structural member has met or exceeded the required strength for detensioning the prestressing bed. If an additional cylinder set as described above has been made, the Contractor may test this set to determine if the required strength for detensioning of the prestressing bed has been met or exceeded, or if the required 28-day compressive strength has been met or exceeded prior to an age of 28 days. The Engineer will accept the results from the compression testing on the additional cylinder set, in place of either the detensioning strength test results, or the 28-day compressive strength test results, if the results equal or exceed the respective compressive strength requirements. If an additional cylinder set was not made, or if the additional cylinder set does not meet or exceed the 28-day compressive strength requirement, the remaining cylinder set shall be tested at 28 days of age to determine the acceptability of the structural members.

SECTION 707, BEGIN LINE 297, DELETE AND INSERT AS FOLLOWS:

The tops of all beams and the outside faces and bottom flanges of the fascia beams shall be sealed in accordance with 709. *The sealing requirement will be waived if the concrete meets the low permeability criteria specified in 707.04(c)1.*

SECTION 707, BEGIN LINE 395, DELETE AND INSERT AS FOLLOWS:

707.08 Handling and Shipping

Precast and precast, prestressed structural members shall not be subjected to excessive abuse which produces crushing or undue marring of the concrete. All structural members damaged during handling, storing, transporting, or erecting shall be replaced. Unless otherwise approved, precast and precast, prestressed structural members shall be handled with a suitable hoisting device provided with a spreader sling. The spreader shall be of sufficient length to prevent horizontal forces being produced in the structural member due to lifting and shall be equipped with leads and hooks at each end. *Unless otherwise*

shown on the contract plans, the location of the lifting points along the tops of the beams shall be in accordance with the transportation support point requirements given herein. If any other method of handling is used, it shall be shown on the working drawings. If the method produces horizontal forces in the precast or precast prestressed structural member, design calculations shall be submitted showing resulting stresses. The design of the structural members shall be satisfactory to handle these stresses in accordance with AASHTO LRFD Bridge Design Specifications. The structural members shall be lifted by the devices and procedures shown on the plans working drawings. Proposed alternate lifting devices and procedures shall be approved prior to use and shown on the working drawings. If any other method of handling is used, it shall be shown on the working drawings and approved prior to use. If the method produces horizontal forces in the precast or precast, prestressed structural member, sufficient reinforcement shall be added to compensate for them.

The structural members shall remain in an upright position at all times and shall be supported as indicated herein when in storage and during transportation to the construction site.

In storage, all structural members shall be fully supported across their width on battens not less than 4 in. wide with one being placed at each end at the centerline of the bearing. The supports of the structural members while in storage shall be maintained in a level position so no twisting occurs.

Precast structural members shall not be *lifted*, shipped, or used until the concrete compressive strength reaches a minimum of 4,500 psi for members which are not prestressed and 5,000 psi for members which are prestressed.

SECTION 707, BEGIN LINE 435, INSERT AS FOLLOWS:

707.09 Placing Structural Members

If the method of lifting the structural members in the field differs from the method shown on the beam fabrication working drawings, the Contractor shall submit working drawings and calculations in accordance with 707.08. Erection of precast, prestressed structural members shall commence at the centerline and proceed out to the curb, one member at a time. As each structural member is placed, the transverse tie bars, if shown on the plans, shall be inserted and secured. Any shifting of the structural members shall be done while they are held free of the supports by the hoisting device. The use of a steel pinch bar will not be allowed. Structural members shall be set to proper line and grade with uniform bearing on bridge seats, mortar joints, or bearing pads as required on the plans. When required, structural members shall be secured to the pier or bent with dowel rods. Holes for dowels shall be filled with mortar at fixed ends and with crack or joint filler at expansion ends. Longitudinal keyway joints shall be cleaned. A coat of cement mortar shall be scrubbed on the surface. The joint shall be filled with a non-shrinking grout composed of 1 part portland cement, 2 parts No. 23 fine aggregate, and an approved non-shrinking additive or a non-shrink, non-metallic cementation grout in accordance with ASTM C1107. All bolts or drains shown on the plans as necessary or desirable to be placed in the concrete shall be placed by the methods and at the locations shown on the plans. Necessary tie rods, tie bolts, and hardware for tying structural members together shall be furnished.

SECTION 707, BEGIN LINE 495, DELETE AND INSERT AS FOLLOWS:

Reinforcing bars, *WWR*, prestressing strands, elastomeric bearing pads, modifications to bearing pads, bearing beams required for box beams, bearing assemblies required for I-beams, bulb-T beams, U-beams, and box beams, bearing plates, threaded reinforcing bars, threaded inserts in fascia beams, hex bolts, sealer on the outside face and bottom flange of fascia beams and on the tops of all beams, *working drawings and design calculations*, and necessary incidentals shall be included in the cost of the pay items of this section. The cost of tensioning rods and steel plates shall be included in the cost of the pay items of this section. The cost for providing all molds, cylinder identification tags, facilities, labor, *testing, testing apparatuses, required trial batches, materials, and materials* ~~all other incidentals~~ necessary to prepare and cure the test specimens ~~required for work in this section~~ *and ensure that the concrete meets the requirements of this specification* shall be included in the cost of the pay items in this section.
