

**DEPARTMENT OF TRANSPORTATION**

DIVISION OF ENGINEERING SERVICES

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June 13, 2013

03-Sac-50-L1.3/L2.2

03-OF2304

Project ID 0300000073

ACBHNH-P050(132)E

Addendum No. 1

Dear Contractor:

This addendum is being issued to the contract for CONSTRUCTION ON STATE HIGHWAY IN SACRAMENTO COUNTY IN SACRAMENTO AT CAMELLIA CITY VIADUCT FROM 0.3 MILE EAST OF RIVERSIDE BOULEVARD UNDERCROSSING TO 26TH STREET UNDERCROSSING.

Submit bids for this work with the understanding and full consideration of this addendum. The revisions declared in this addendum are an essential part of the contract.

Bids for this work will be opened on Wednesday, July 17, 2013, instead of the original date of Wednesday, June 26, 2013.

This addendum is being issued to set a new bid opening date as shown herein and revise the project plans, the *Notice to Bidders and Special Provisions*, and the Federal Minimum Wages with Modification Number 10 dated 06/07/2013.

Project plan sheet 159 is replaced and attached for substitution for the like-numbered sheet.

In the Special Provisions, Section 51, "CONCRETE STRUCTURES," is replaced as attached.

In the Special Provisions, Section 55-2.04, "PAYMENT," is replaced with the following:

**"55-2.04 Payment**

Whenever an alternative or option is shown or noted on the plans or permitted by these special provisions, the quantity of the structural steel column casings to be paid for will be computed on the basis of the dimensions, details and types of structural steel column casings shown and no increase or decrease in the quantity to be paid for will be made for any variation because of the use by the Contractor of the alternatives or options."

In the Special Provisions, Section 75-1.03D(1), the following item is added to the list of the first paragraph.

"7. Design, construct, remove and dispose of temporary deck drainage system."

In the Special Provisions, Section 83-2.02D(1), is added as attached.

In the Special Provisions, Section 83-2.03D(1), is deleted.

In the Special Provisions, Section 90-1.02A, is replaced as attached.

In the Special Provisions, Section 90-1.02E(2), is added as attached.

Addendum No. 1  
Page 2  
June 13, 2013

03-Sac-50-L1.3/L2.2  
03-0F2304  
Project ID 0300000073  
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To *Bid* book holders:

Inquiries or questions in regard to this addendum must be communicated as a bidder inquiry and must be made as noted in the *Notice to Bidders* section of the *Notice to Bidders and Special Provisions*.

Indicate receipt of this addendum by filling in the number of this addendum in the space provided on the signature page of the *Bid* book.

Submit bids in the *Bid* book you now possess. Holders who have already mailed their book will be contacted to arrange for the return of their book.

Inform subcontractors and suppliers as necessary.

This addendum, attachments and the modified wage rates are available for the Contractors' download on the Web site:

**[http://www.dot.ca.gov/hq/esc/oe/project\\_ads\\_addenda/03/03-0F2304](http://www.dot.ca.gov/hq/esc/oe/project_ads_addenda/03/03-0F2304)**

If you are not a *Bid* book holder, but request a book to bid on this project, you must comply with the requirements of this letter before submitting your bid.

Sincerely,



REBECCA D. HARNAGEL  
Chief, Office of Plans, Specifications & Estimates  
Office Engineer  
Division of Engineering Services

Attachments

## 51 CONCRETE STRUCTURES

### Add to section 51-1.01A under paragraph 1:

Concrete is structural concrete, bridge for:

Bridge no.	Description of work
Camellia City Viaduct (Br No 24-0248R/L)	<ol style="list-style-type: none"> <li>1. Sign pedestal at bent cap</li> <li>2. Concrete to fill temporary interior girder openings</li> <li>3. Base of concrete barrier (Type 732) on top of retaining walls</li> <li>4. Base of concrete barrier (Type 732 Modified) on top of wingwalls</li> </ol>

Structural concrete, bridge also includes:

Bridge no.	Description of work
Camellia City Viaduct (Br No 24-0248R/L)	<ol style="list-style-type: none"> <li>1. Furnishing and placing polyvinyl chloride (PVC) sleeves around existing rod restrainers.</li> <li>2. Roughening existing concrete surfaces to a full amplitude of approximately 1/4-inch by abrasive blasting, water blasting, or mechanical equipment.</li> <li>3. An optional cored hole may be placed through the deck to accommodate the placement of the interior sign pedestal anchorages.</li> </ol>

Concrete is structural concrete, fiber-reinforced portland cement concrete (PCC) overlay for the following portion of the bridge and must comply with section 51-8:

Bridge no.	Description of work
Camellia City Viaduct (Br No 24-0248R/L)	<ol style="list-style-type: none"> <li>1. Work plan for implementation of deck rehabilitation work</li> <li>2. Furnishing, placing, removing and disposing of fiber-reinforced portland cement concrete trial overlay and concrete base</li> <li>3. Overlay</li> <li>4. Grinding and grooving deck overlay surface texture to comply with section 51-1.03F(5)(b)</li> </ol>

Concrete is structural concrete, bridge (modified) for:

Bridge no.	Description of work
Camillia City Viaduct (Br No 24-0248R/L)	1. Work plan for implementation of bridge deck widening and overhang work 2. Bridge widening 3. Bridge overhang 4. Concrete encasing the bridge deck drainage system 5. Grinding and grooving deck surface texture to comply with section 51-1.03F(5)(b)

**Add to section 51-1.01C(1) before paragraph 1:**

Submit at least 30 days before placing the bridge widening and deck overhang. Include in the submittal:

1. Concrete mix design and certified test data
2. Trial batch test reports
3. Concrete placement shop drawings

**Add section 51-1.01C(6):**

**51-1.01C(6) Work Plan for Implementation of Designated Staged Bridge Work**

**51-1.01C(6)(a) General**

Perform the designated staged bridge work shown during the first 30-day full-width bridge closure on EB 50 between Abutment 1 and Abutment 26 (between 18th to 24th Street).

Perform the designated staged bridge work shown during the second 30-day full-width bridge closure on WB 50 between Abutment 1 and Abutment 26 (between 18th to 24th Street).

Submit a preliminary detailed work plan for implementation of each 30-day full-width road closure, completion of designated staged bridge work and opening the bridge to traffic within 14 days after contract approval. Submit the final work plan, for authorization by the Engineer, no less than 60 days before the first 30-day full-width bridge closure. The Engineer reviews the work plans within 15 days and accepts, rejects or accepts with comments.

**51-1.01C(6)(b) Work Plan for Implementation of Designated Staged Bridge Work**

Meet with the Engineer to discuss and submit a work plan for implementation of the designated staged bridge work shown including detailed procedures, sequences and all features required to perform and complete said work in a safe and controlled manner during each 30-day full-width bridge closure. Include the following for each 30-day full-width bridge closure:

1. Methods, construction sequences, and timelines in one hour increments, from the beginning to the end of the noted various types of work to be performed, and the length of time to complete each operation.
2. Traffic flow and movement of workers, equipment and materials.
3. Identify type, model number and weight of equipment to be used for the various operations (including reaches of equipment) and provide layouts for these operations located on and below the bridge.
4. Detail all equipment, materials, labor and work necessary to close the bridge to traffic, perform the designated bridge work shown and open the bridge to traffic.
5. Methods to achieve the water cure. Method to apply curing compound and designate full set-up times for different ambient conditions.

6. After the new deck overlay and shoulders are placed, provide timelines to:
  - 6.1. Prepare and clean deck surface for testing of roadway surface
  - 6.2. Complete the testing of roadway surface by the Engineer
  - 6.3. Take corrective measures of grinding to comply with section 42 and treating deck with methacrylate
  - 6.4. Grind and groove deck and approach slab surfaces to comply with section 51-1.03F(5)(b). Grinding and grooving bridge deck surfaces is to occur at one of the following times:
    - 6.4.1. Between the end of at least the 3-day (72-hour) water cure and before applying the curing compound.
    - 6.4.2. After the curing compound is applied and remains in place for 7 days.
    - 6.4.3. Within the first week the curing compound is to remain in place except that curing compound is to be reapplied immediately after grinding and grooving work is complete.
7. Contingency plan for equipment, material failures, or a delay in concrete delivery or placement.
8. Locate construction joints for deck overlays and bridge deck widenings in a layout view. Provide details for the deck construction joints for deck overlays.

**Add section 51-1.01C(7):**

**51-1.01C(7) Staged Bridge Work Submittals and Acceptance of Bridge Materials and Systems before Bridge Closure**

Submit and complete the following before performing designated bridge work shown for the 30-day bridge closure:

1. Shop plans with supporting calculations for falsework, formwork and protective covers for bridge-work.
2. Bridge removal work plans.
3. Concrete mix design, certified test data, and trial batch reports. Deck placement work plans.
4. The Department must have accepted the following bridge materials:
  - 4.1. Deck drain elements
  - 4.2. Bar reinforcing steel
  - 4.3. Fibers
  - 4.4. Chain link railing
  - 4.5. Joint seal adhesives and sealants
  - 4.6. Type B joint seals
  - 4.7. Pull boxes for concrete barriers on the bridge deck
5. Placed and evaluated trial overlay,
6. Acceptable work plan for implementation of the 30-day full-width road closure for designated staged bridge work
7. Listing of all preliminary work to be performed before the 30-day road closure and authorized by the Engineer.
8. Temporary deck drainage system until the bridge deck drainage system is complete in place.

Have the necessary materials, equipment and other resources for the designated staged bridge work shown, on site before the beginning of each 30-day full-width bridge closure.

**Replace section 51-1.01D(1) with:**

**51-1.01D(1) General**

Perform the following tests and texture the bridge deck surfaces by grinding and grooving of the bridge decks and bridge deck overlays in this order:

1. Surface smoothness test of the existing deck surface and shoulders (before cold-milling work) and existing approach slabs
2. Surface smoothness test of the new deck surface, shoulders and approach slabs after new approach slabs, overlay and widening are placed
3. Surface crack intensity must comply with section 51-1.01D(4)(d) for new bridge decks

4. Grinding and grooving of bridge decks and approach slabs for bridge deck surface texture must comply with section 51-1.03F(5)(b)
5. Skid tests for coefficient of friction must comply with section 51-1.01D(4)(c) for new bridge decks and new approach slabs

**Replace the 2nd paragraph of section 51-1.01D(4)(b) with:**

Schedule smoothness testing of the existing deck and approach slab surfaces 3 days in advance of performing deck cold-milling work. Immediately after cleaning deck and before cold-milling and cleaning work and before the 30-day bridge closure, allow 4 hours for the Engineer to perform smoothness testing.

Schedule smoothness testing of the new deck, shoulders and approach slab surfaces 1 day in advance. Allow 4 hours for the Engineer to perform smoothness testing for all 6 complete lanes at one time.

**Add after the 1st paragraph of section 51-1.01D(4)(d) with:**

Schedule surface crack testing of the new deck surface 1 day in advance. Allow 4 hours for the Engineer to measure the crack intensity of new deck surfaces.

**Add after the 1st paragraph of section 51-1.01D(4)(c) with:**

Schedule skid testing of the new deck and approach slab surfaces 1 day in advance. Allow 24 hours for the Engineer to complete the skid tests for all 6 complete lanes at one time or 4 hours to complete the skid test for one complete lane.

**Add to section 51-1.02A:**

Prequalify structural concrete, bridge (modified) under section 90-1.01D(5) before placement of the bridge widening and deck overhang.

Structural concrete, bridge (modified) must comply with the shrinkage requirements in section 90-1.02A:

Concrete for the structural concrete, bridge (modified) work as shown must comply with the following:

1. Not allow use of RSC
2. No Type C accelerating admixture
3. No Type III portland cement.
4. No accelerated concrete mix components
5. Allow use of shrinkage reducing admixture (SRA)
6. Water cure for at least 3 days (72 hours) and achieves a minimum compressive strength of 3,250 psi when water cure is stopped
7. A reduced water cure time will not be considered

**Add 6 rows to the table in the 1st paragraph of section 51-1.02B:**

Bridge deck widening and overhang concrete	675 min, 800 max
Bridge deck fiber-reinforced portland cement concrete overlay	675 min, 800 max
Concrete barrier on bridge deck supporting lighting fixtures	675 min, 800 max
**Bridge deck widening and overhang concrete	742 min, 800 max
**Bridge deck fiber-reinforced portland cement concrete overlay	742 min, 800 max
**Concrete barrier on the bridge deck supporting lighting fixtures	742 min, 800 ma

\*\*If a Type F or G chemical admixture is used

**Replace the 1st two paragraphs in section 51-1.03B with:**

Vehicles weighing over 1,000 lb are not allowed on any bridge span until the concrete attains a compressive strength of at least 2,400 psi. Vehicles weighing over 4,000 lb are not allowed on any span until the concrete attains a compressive strength of at least 3,250 psi.

Vehicles exceeding the weight limitations in Veh Code Div 15 that cross bridges as allowed in section 5-1.37B must not make repetitive crossings of any span until the concrete attains a compressive strength of at least 3,600 psi.

**Replace the 2nd paragraph of section 51-1.03H with:**

Cure the top surface of bridge decks and deck overlays using first the water method for the designated time below and then the curing compound method. Water for curing must comply with section 90-1.02D. The curing compound must comply with section 90-1.01D(6) and be curing compound no. 1.

Curing the bridge concrete deck surface, including deck widening, deck overhang and deck fiber-reinforced PCC overlay surfaces, must comply with the following

1. During the initial curing period (between placement and finishing), direct mist atomized water spray of sufficient velocity to reach exterior edges and at a rate not to disturb the fresh concrete surface. Continue misting as necessary to maintain reflective appearance of damp concrete. Do not allow the surface to dry or to undergo cycle of drying or wetting.
2. Immediately after finishing concrete surface, cure the top surface of the deck using the water method to comply with section 90-1.03B(2). Continue misting until placement of the curing medium.
3. Place curing medium as soon as possible without disturbing the surface.
4. Water cure for at least 3 days (72 hours) beginning after final finishing of concrete from the last truckload is completed.
5. At the end of the water curing period, remove the curing medium and remove freestanding water. Mist may be used to keep deck moist before the curing compound is applied. Apply curing compound to the bridge deck surface to comply with section 90-1.03B(3). Allow the curing compound to fully set up.

**Replace the 1st paragraph in section 51-1.03F(5)(b)(i) with:**

Camillia City Viaduct (Bridge No. 24-0248R/L) is located in a noise sensitive area.

Texture the bridge deck widening and overhang and bridge deck fiber-reinforced PCC overlay and approach slab surfaces longitudinally by grinding and grooving.

**Add under paragraph 1 in section 51-1.04:**

Payment for optional coring and filling holes with concrete and roughening existing concrete surfaces to minimum 1/4-inch amplitude is included in the payment for structural concrete, bridge.

Payment for providing, installing, maintaining and removing of a temporary deck drainage system is included in the payment for bridge deck drainage system.

Payment for longitudinal grinding and grooving of the bridge deck and approach slab surfaces is included in the payment for structural concrete, bridge (modified) and structural concrete, approach slab (Type R).

Payment for optional furnishing and placement of additional curing compound if grinding and grooving occurs within the first week the curing compound is to remain in place, is included in the payment for structural concrete, bridge (modified) and structural concrete, approach slab (Type R).

Payment for bonding dowels for the B3 curb is included in the payment for drill and bond dowel. Payment for furnishing dowels for the B3 curb is included in the payment for minor concrete (miscellaneous construction).

Structural concrete, bridge (modified) is measured by the cubic yard.

**Add to section 51-2.02A:**

Joint seals for movement ratings of 2 inches must be Type B joint seals.

**Add section 51-8 with:**

**51-8 BRIDGE DECK FIBER-REINFORCED PORTLAND CEMENT CONCRETE OVERLAY**

**51-8.01 GENERAL**

**51-8.01A Summary**

Section 51-8 includes specifications for designing and placing a fiber-reinforced portland cement concrete overlay on an existing bridge deck.

Fiber-reinforced portland cement concrete (PCC) must comply with the shrinkage requirements in section 90-1.02A.

Work plan for implementation of designated bridge work shown during the two 30-day full-width bridge closures under sections 51-1.01C(6) and 51-1.01C(7) and must incorporate the work for the fiber-reinforced portland cement concrete overlay.

**51-8.01B Definitions**

**CRR:** Crack reduction ratio.

**equivalent flexural strength ratio ( $R_{T,150}^D$ ):** Ratio of toughness (deflection at L/150) to the Peak load times beam length per ASTM C1609/C1609M.  $R_{T,150}^D$  value is equivalent to the  $R_{e,3}$  value.

**hot weather:** A combination of high ambient temperature, high concrete temperature, low relative humidity, wind velocity, or solar radiation that may cause excessive evaporation.

**residual strength:** The flexural stress on the cracked beam section obtained by calculation using loads obtained from the reloading curve at specified deflection values. Residual strength is not a true stress but an engineering stress computed using the flexure formula for linear elastic materials and gross (uncracked) section properties.

**SRA:** Shrinkage-reducing admixture or also referred to as Type S admixture.

**SSD:** Saturated surface dry.

**HWRA:** High range water-reducing admixture.

**51-8.01C Submittals**

**51-8.01C(1) General**

Submit at least 5 days after contract award the concrete base mix design.

Submit the following at least 30 days before placing fiber-reinforced PCC trial overlay.

1. Fiber-reinforced PCC overlay mix design
2. Certified test data and trial batch test reports
3. Details and placement procedures for the trial overlay
4. Crack reduction ratio (CRR) (ASTM C 1579) test reports
5. Equivalent structural crack ratio ( $R_{T,150}^D$ )(ASTM C 1609) test reports

After the trial overlay is constructed, submit to Engineer written test results from test samples taken during trial overlay construction.

Submit daily progress reports during trial overlay and production fiber-reinforced PCC overlay work. Daily progress reports must be signed by an engineer who is registered as an engineer in the State. At a minimum include:

1. Air temperature, relative humidity, wind velocity and general weather conditions. For relative humidity rate refer to Table Hot Weather Concrete ACI 305 R-5 to determine rate of evaporation.
2. Time batched, time discharge started and time discharge completed
3. All HWRAs added to the mix after batching with corresponding mixing times
4. Concrete temperature at time of delivery and after placement
5. Penetration of concrete will be measured and monitored as discharged from the tail gate
6. Observations on the performance and appearance of concrete as delivered and after placement:
7. Protection and curing per segment
  - 7.1. Method and duration
  - 7.2. Time and rate of application
  - 7.3. Visual appearance

#### **51-8.01C(2) Work Plan**

Submit a work plan at least 60 days before deck fiber-reinforced PCC overlay-placement. Include in the plan:

1. Schedule and sequencing of fiber-reinforced PCC overlay work and testing for each stage of bridge deck overlay work.
2. Method for isolating expansion joints.
3. Selection of a limiting temperature in concrete or the expected jobsite high temperature. Verify in trial batches.
4. Method for disposal of excess fiber-reinforced PCC.
5. Anticipated atmospheric and temperature conditions during placement and curing operations.
6. Additional precautions and procedures to be taken to minimize adverse effects of hot-weather concreting. Describe types of protection and additional efforts to be taken to prevent moisture loss.
7. Special measures to be taken for protection and curing of strength test specimens in hot weather to maintain specimens at a temperature of 60 to 80 degrees F and to prevent moisture loss during initial curing process.
8. Special measures to be taken to achieve maximum 80 degrees F fiber-reinforced PCC temperature at time of placement.
9. Locations of construction joints.
10. Details for repairing fiber-reinforced PCC overlay in the wet condition and the dry condition.

#### **51-8.01C(3) Product Data**

Submit the manufacturer's descriptive and technical literature for fibers.

#### **51-8.01C(4) Certificate of Compliance**

Submit a certificate of compliance for the fibers.

#### **51-8.01C(5) Manufacturer's Instructions**

At least 15 days before placing the trial slab submit fiber manufacturer's instructions for:

1. Type of fibers proposed for use
2. Method for storage and handling of fibers
3. Description of equipment or suitable techniques for measuring, and dispensing the fibers into the mixer free of fiber balls when batching at the ready mix plant
4. Truck mixing fibers
5. Suitable techniques for pumping, placing and finishing fiber-reinforced PCC in addition to the techniques specified in the standard specifications
6. Method to remove and repair defects

#### **51-8.01D Quality Control and Assurance**

##### **51-8.01D(1) General**

An engineer or a designated representative who is registered as a civil engineer in the State must be present during the trial overlay and bridge deck fiber-reinforced PCC overlay placement work.

**51-8.01D(2) Prequalification**

Prequalify the fiber-reinforced PCC section 90-1.01D(5) before placement of the trial overlay.

**51-8.01D(3) Concrete Base**

The concrete base must:

1. Be at least 24 feet wide by 50 feet long or as determined by the Engineer and the same thickness as the trial overlay.
2. Be reinforced concrete that closely resembles the reinforced concrete from the existing bridge deck.
3. Be constructed as a first order of work.

**51-8.01D(4) Concrete Test Batch**

Concrete test batches are to be performed before the trial overlay.

**51-8.01D(5) Preconstruction Meetings****51-8.01D(5)(a) General**

Provide a meeting facility that is within 5 miles of the job site or at another location accepted by the Engineer. Include the Engineer, your representatives, fiber manufacturer representative and concrete supplier, and any subcontractors involved in designing and constructing the fiber-reinforced PCC trial overlay. Select a date and time that is acceptable to the Engineer and so that all participants will attend.

The Engineer will conduct the meetings.

**51-8.01D(5)(b) Trial Overlay Preconstruction Meeting**

Schedule and attend a trial overlay preconstruction meeting with the Engineer. Schedule the meeting (1) at least 25 days after submitting the fiber-reinforced PCC overlay mix design and placement procedure, and (2) at least 5 days before the start of fiber-reinforced PCC trial overlay construction.

The trial slab preconstruction meeting is to:

1. Establish contacts and communication protocol between you and your representatives, any subcontractors, fiber manufacturer representative, concrete supplier and the Engineer involved in designing and constructing the fiber-reinforced PCC trial overlay
2. Provide date, time, location to place trial slab, equipment list with model numbers and staff to be used to construct and take test samples from the trial overlay
3. Review the construction process, acceptance testing, curing, surface texturing and repair of fiber-reinforced PCC overlay
4. Review the applicable specifications or qualification procedures

**51-8.01D(5)(c) Trial Overlay Postconstruction Meeting**

Schedule and attend the trial overlay postconstruction meeting with the Engineer. Schedule the meeting at no more than 10 days after completing the trial overlay or as otherwise determined by the Engineer with consensus from the group. All attendees from the preconstruction meeting must attend the postconstruction meeting.

Be prepared to discuss the following:

1. Adjustments/improvements to be made determined from the trial overlay
  - 1.1. Mix design and placement procedure
  - 1.2. Work plan
  - 1.3. Workability of mix
  - 1.4. Techniques that need work and methods to improve
    - 1.4.1. Mixing techniques to achieve uniform mixtures
    - 1.4.2. Preparation of interface existing surface
    - 1.4.3. Placing techniques to assure adequate compaction
    - 1.4.4. Adequate finishing techniques to assure satisfactory surface texture
    - 1.4.5. Curing techniques
    - 1.4.6. Timing of grinding and grooving techniques
  - 1.5. Workmanship
2. Comments and review of the work plan
3. Preliminary work for overlay performed prior to road closure
4. Construction schedule
5. Daily progress reports
6. Safety requirements, including Cal/OSHA

#### **51-8.01D(6) Trial Overlay**

The Engineer is to determine the location of the concrete base and the trial overlay. The location will be within a 15-mile radius from the job site.

Complete a trial overlay at least 30 days before starting production overlay activities. The trial overlay must be constructed, finished, cured and textured within the allowed time with the materials, tools, equipment, personnel, and methods to be used in the production work.

The trial overlay must:

1. Be at least 24 feet wide by 50 feet long or as determined by the Engineer and the same thickness as the project overlay
2. Be constructed on a prepared concrete base
3. Be placed within the project limits at an authorized location
4. Be constructed using the same equipment as the production work
5. Replicate field conditions for the production work
6. Be used to determine the initial fiber-reinforced PCC set time
7. Demonstrate suitability of the proposed means and methods

Trial overlays must demonstrate that you are capable of producing fiber-reinforced PCC overlays within the anticipated time periods, including delivery, placement, finishing, and curing times, and under similar atmospheric and temperature conditions expected during construction operations. Multiple trial slabs for each concrete mix design may be required to encompass variable atmospheric conditions.

Test the trial overlay concrete for compressive strength under section 90-1.01D(5) at 24 hours, 2 days, 3 days, 7 days, and 28 days.

The Engineer determines acceptability of the trial overlay and construction procedures.

Dispose of the trial overlay and concrete base after acceptance.

## **51-8.01D(7) Acceptance Criteria**

### **51-8.01D(7)(a) Acceptance Criteria for the Trial Overlay and for the Production Fiber-Reinforced PCC Overlay**

Fiber-reinforced PCC for the trial and the production fiber-reinforced PCC overlays must achieve:

1. A compressive strength of 3,250 psi at 3 days (72 hours)
2. A compressive strength of 4,000 psi at 28 days
3. Shrinkage requirements in section 90-1.02A
4. Maximum allowable water to cementitious material ratio is 0.45
5. Minimum crack reduction ratio (CRR) of 87 percent (ASTM C 1579)
6. Minimum equivalent structural crack ratio ( $R_{T,150}^D$ ) of 25 percent (ASTM C 1609)
7. A nearly fiber-free finished surface
8. The required smoothness, surface texture and surface crack requirements for finishing bridge decks
9. Longitudinal surface texture by grinding and grooving

Fiber-reinforced PCC for the trial and the production fiber-reinforced PCC overlays must maintain:

1. Rate of surface evaporation below 0.2 lb/sqft/hr
  - 1.1. Measure air temperature, relative humidity, concrete temperature and wind velocity to determine the maximum rate of surface evaporation
  - 1.2. Incorporate precautions when surface evaporation approaches 0.2 lb/sqft/hr.
2. Water cure for at least 3 days (72 hours) followed by curing compound.
3. Curing water temperature not lower than 20 degrees F cooler than the surface temperature of the concrete at the time the water and concrete come into contact.

## **51-8.02 MATERIALS**

### **51-8.02A General**

Fiber-reinforced PCC consists of portland cement concrete with fibers.

#### **51-8.02A(1) Concrete**

Concrete for bridge deck fiber-reinforced PCC overlay must comply with the following:

1. Not allow use of RSC
2. No Type C accelerating admixture
3. No Type III portland cement.
4. No accelerated concrete mix components
5. Allow use of shrinkage reducing admixture (SRA)
6. Water cure for at least 3 days (72 hours) and achieves a minimum compressive strength of 3,250 psi when water cure is stopped
7. A reduced water cure time will not be considered

Protect concrete from rapid temperature drops - not to exceed 5 degrees F per hour or more than 50 degrees F in 24 hours.

#### **51-8.02A(2) Combined Aggregate Grading**

For the fiber-reinforced PCC overlay use the 1-inch maximum combined aggregate grading complying with section 90-1.02C(4)(d). The percent passing the no. 4 sieve must be 45 to 55.

#### **51-8.02A(3) Fiber-Reinforced Portland Cement Concrete**

Types of fiber-reinforced concrete per ASTM C 1116/C 1116M not allowed for the bridge deck fiber-reinforced PCC overlay are:

1. Sec. 4.1.1 - Type I Steel Fiber-Reinforced Concrete
2. Sec. 4.1.2 - Type III Glass Fiber-Reinforced Concrete
3. Sec. 4.1.4 - Type IV Natural Fiber-Reinforced Concrete

Fibers for fiber-reinforced concrete must comply with the following:

1. Fibers for fiber-reinforced portland cement concrete must comply with the requirements of ASTM C1116/C 1116M; Paragraph 4.1.3 - Type III Synthetic Fiber-Reinforced Concrete.
2. Fiber reinforcement must be added to the concrete truck at the ready mix plant when coarse aggregate is added or as indicated by the fiber manufacturer
3. Both a micro and a macro synthetic fiber-reinforcement blended system of virgin polyolefin or polypropylene must be used as shown in the tables below.
4. Do not add water to the concrete truck after it leaves the ready-mix plant or add finish water to the fiber-reinforced PCC
5. Fiber-reinforced PCC during placement must not exceed 80 degrees F
6. Physical Property Requirements for the fibers are:

**Fiber Reinforced Mix Design Requirements**  
**Fiber Material: MicroSynthetic Fiber**  
**Reinforcement**

Property	Requirement
Fiber Length (Normal)	1/2 inch to 3/4 inch
Minimum Tensile Strength	60 ksi
Modulus of Elasticity	Minimum 300ksi
Melt Point	320°F
Chemical Resistance	Excellent
Alkali, Acid and Salt Resistance	High
Ignition Point	1090°F
Absorption	Nil
Specific Gravity	0.91
Dosage (Normal)	As recommended by the manufacturer as required to meet acceptance criteria
Form (Material)	Virgin Polypropylene fibers

NOTE:

**Fiber Reinforced Mix Design Requirements  
Fiber Material: Macro Synthetic Fiber  
Reinforcement**

Property	Requirement
Fiber Length (Normal)	1.00 inch to 2.00 inches
Minimum Tensile Strength	40 ksi
Modulus of Elasticity	Minimum 380 ksi
Melt Point	320°F
Chemical Resistance	Excellent
Alkali, Acid and Salt Resistance	High
Ignition Point	1094°F
Absorption	Nil
Specific Gravity	0.91
Dosage (Normal)	As recommended by the manufacturer as required to meet the acceptance criteria
Form(Material)	Virgin Polyolefin or Polypropylene only

NOTE:

**51-8.03 CONSTRUCTION**

The Engineer provides final grade and cross slope before the start of production overlay work.

Before coldmilling, the Engineer is to test existing deck surface smoothness under section 51-1.01D(4)(b) and may require you to modify the existing deck smoothness under section 42-3. Modifying the existing deck smoothness is change order work.

Construction of approach slabs must be complete before placing bridge deck fiber-reinforced PCC overlay.

After drilling and bonding dowels, abrasive blast clean and blow the deck clean with compressed air.

Thoroughly mix all components of the fiber-reinforced PCC to comply with the fiber manufacturer's instructions. Provide a screen over the concrete pump hopper that is capable of preventing any fiber balls from entering the pump.

Any improperly batched fiber-reinforced PCC which develops dry balls of fibers or a significant number of wet fiber balls (which includes fibers and material) will be rejected, discarded, and removed from site.

Flush existing cold-milled and cleaned deck surfaces with water and allow the surface to dry to a surface-saturated dry (SSD) condition before placing the fiber-reinforced PCC overlay. Take due care to manage this interface surface as noted.

Place and finish bridge deck fiber-reinforced PCC overlay.

Use magnesium floats to establish a surface to close up any tears or open areas to the surface. Wooden floats are not allowed.

Cure the top surface of the bridge deck fiber-reinforced PCC overlay to comply with section 51-1.03H.

#### **51-8.04 PAYMENT**

Structural concrete, fiber-reinforced portland cement concrete overlay is measured by the cubic yard.

Payment for longitudinal grinding and grooving of the bridge deck fiber-reinforced PCC overlay surfaces is included in the payment for structural concrete, fiber-reinforced portland cement concrete overlay.

Drill and bond dowels are measured by the linear foot of accepted drilled holes and furnishing dowels are paid for separately.

Payment for providing preconstruction and postconstruction meeting facilities for the parties involved in constructing the trial and production overlays is included in the payment for structural concrete, fiber-reinforced portland cement concrete overlay.

Payment for trial overlays and concrete base for the trial overlay, and the removal and disposal thereof, is included in the payment for structural concrete, fiber-reinforced portland cement concrete overlay.

Payment for coldmilling the concrete base for the trial slab surface interface and cleaning the concrete base surface is included in the payment for prepare concrete bridge deck surface.

Payment for furnishing and placing bar reinforcing steel and drilling and bonding dowels placed in the trial overlay are included in the payment for bar reinforcing steel (bridge) and drill and bond dowels that are placed in the trial overlay.

**Add to section 83-2.02D(1):**

Concrete barrier (Type 732), (Type 732B) and (Type 732 Modified) also includes:

Bridge no.	Description of work
Camellia City Viaduct (Widen/Br Rehab) (Br No 24-0248R/L))	<ol style="list-style-type: none"><li>1. Work plan for implementation of (a) bridge removal (portion) work, (b) bridge deck widening and deck rehabilitation work and (c) barrier replacement work.</li><li>2. Barrier construction is to be performed within the 30-day full-width bridge closure.</li><li>3. Barrier must achieve the noted compressive strength before placement of the new lighting standards which is also within the 30-day full-width bridge closure.</li><li>5. Furnishing and installing Type 1 conduit used for the electrical conduit inside of the concrete barrier conforming to the requirements in section 86-2.05.</li><li>6. Stenciling and painting bridge numbers and bridge names, bent and abutment numbers on the concrete barrier wall under section 51-1.03E.</li></ol>

Work plan for implementation of (a) bridge removal (portion) work, (b) bridge deck widening and deck rehabilitation work and (c) barrier replacement work during the two 30-day full-width bridge closures under section 51-1.01C(6) and 51-1.01C(7) and must incorporate the barrier replacement work noted herein.

Concrete used for concrete barriers located on top of the bridge must be the same concrete mix design used for the structural concrete, bridge (modified) work or if another concrete mix design is used, it must be pre-qualified and meet the same requirements as listed for structural concrete, bridge (modified) under section 51-1.02A.

Placing, finishing and curing the concrete barrier surface must comply with section 83-2.02D(3).

Place lighting standards after concrete has attained the minimum designated compressive strength shown on the work plan for implementation for barrier replacement work.

Do not anchor lighting standards to concrete elements of bridges or railing until the concrete achieves a compressive strength of 3,600 psi that is determined from concrete cylinder breaks.

**Replace the 1st paragraph in section 90-1.02A with:**

Concrete for pavement, approach slabs, bridge decks, bridge deck widenings and overhang and bridge deck fiber-reinforced PCC overlay must comply with the shrinkage limitations shown in the following table when tested under section 90-1.01D(3):

Type of work	Maximum length change of laboratory cast specimens at 28 days drying (average of 3) (percent)
Paving and approach slab concrete	0.050
Bridge deck concrete	0.045
Bridge deck widening and overhang concrete	0.030
Bridge deck fiber-reinforced portland cement concrete overlay	0.030

**Replace the third paragraph in section 90-1.02E(2) with:**

If you use a water-reducing admixture or a water-reducing and retarding admixture, you may reduce the specified cementitious material content by up to 5 percent by weight. The resulting concrete must contain at least 505 pounds of cementitious material per cubic yard. If the minimum cementitious material content is 742 pounds per cubic yard and you use a high range water-reducing admixture or a high range water-reducing and retarding admixture, you may reduce the specified cementitious material content by up to 15 percent by weight. If you reduce the cementitious material content, use at least the admixture dosage used in authorizing the admixture as shown on the Authorized Material List.