SPECIAL PROVISIONS
FOR
PROPRIETARY ULTRA-HIGH PERFORMANCE CONCRETE

Webster County
MB-926-1(506)1--77-94

Effective Date
July 19, 2022

THE STANDARD SPECIFICATIONS, SERIES 2015, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE SPECIAL PROVISIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

150863.01 DESCRIPTION.

This work consists of using proprietary ultra-high performance concrete (UHPC) for the field repair of deteriorated pretensioned prestressed concrete beam (PPCB) ends. The concrete mixture described in this special provision shall be used at locations specified on the project plans. All work shall be in accordance with the Standard Specifications, except as modified herein.

150863.02 MATERIALS.

A. Mixture Ingredients

All materials required for the proprietary UHPC shall be premixed and proportioned in bags or supersacks, and come from the same batch or lot.

1. **Cement and/or Blended Hydraulic Cements:** In accordance with Section 4101 of the Standard Specifications, as provided or specified by the UHPC Manufacturer and by the approval of the Engineer.

2. **Fine Aggregate:** As provided or specified by the UHPC Manufacturer and by the approval of the Engineer.

3. **Water:** In accordance with Section 4102 of the Standard Specifications.

4. **Admixture(s):** As provided or specified by the UHPC Manufacturer and by the approval of the Engineer.

5. **Steel Fiber:** In accordance with ASTM A820, as provided or specified by the UHPC Manufacturer and by the approval of the Engineer.

B. Submittals.

Submit the following to the Engineer for review and approval, at least 15 calendar days before trial mixing and field casting can take place:

- Individual material certifications and UHPC mixture properties (provided by the UHPC Manufacturer, following ASTM and/or AASHTO Standards), in terms of minimum compressive strengths after 7 and 28 days (heat-treated and not heat-treated), prism flexural tensile toughness, long-term shrinkage, chloride ion penetrability, scaling resistance, abrasion resistance, alkali-silica reaction, and freeze-thaw resistance.
- A Quality Control plan that shall include, but is not limited to, the following: (1) Mixing protocol; (2) Casting procedure; (3) Sampling and testing procedure; (4) Curing procedure; and (5) Finishing procedure after field placement.

150863.03 CONSTRUCTION.

A. Storage.

Assure the proper storage of all constituent materials, including but not limited to cement, aggregates, additives, and steel fibers, as required by the UHPC Manufacturer's specifications in order to protect the integrity of the materials against the loss of physical, chemical, and mechanical properties.

B. Placement Plan and Pre-Pour Meeting.

1. Submit a Placement Plan (with a detailed field work schedule) to the Engineer for review and approval at least 15 calendar days prior to the scheduled UHPC placement pour. The following list is intended as a guide and may not address all the means and methods the Contractor may elect to use. The Contractor is expected to assemble a comprehensive list of all necessary items for executing the placement of UHPC.

- Responsible personnel and hierarchy.
- Equipment – including but not limited to mixers, holding tanks, generators, wheelbarrows, scales, meters, thermometers, floats, screeds, burlap, plastic, heaters, blankets, etc.
- Quality Control of batch proportions – including dry ingredients, steel fibers, water, and admixtures.
- Quality Control of mixing.
- Batch procedure sequence.
- Formwork – including materials and removal.
- Placement procedure – including but not limited to the preparation of existing concrete surfaces (in terms of roughness and wetness) before UHPC placement, in addition to spreading, finishing, and curing details.
- Threshold limits for ambient temperature, ambient relative humidity, batch consistency, batch temperature, batch times, and related corrective actions as appropriate.

2. Arrange for an onsite meeting with the Engineer and the Research Personnel at least 7 calendar days prior to the UHPC placement. The objective of the meeting will be to outline the procedures for mixing, transporting, finishing, and curing of the UHPC.

C. Trial Batch and Test Placement.

1. Produce a trial batch and perform a test placement. Provide the Engineer and the Research Personnel notice and mix proportions at least 7 calendar days prior to this event. The trial placement will be witnessed by the Engineer.

2. Mix the trial batch at least 15 calendar days prior to the planned field placement. The trial batch shall be of sufficient quantity to complete the test placement. Produce the trial batch under the same ambient conditions (e.g. time of day, weather, etc.) as anticipated during the

field work. Include documentation of ambient conditions at the time of trial batch and anticipated ambient conditions at the time of trial placement in the submittal to the Engineer.

3. For mockup test placement, prepare a full-scale trial batch mix and place in a full-scale mockup as shown in the project plans. Use at least the minimum mix capacity of the mixing equipment for the trial batch, including quantities for sampling and testing. Use the same equipment and the same forming, casting, and curing procedures that will be used during the field work for the trial placement.

4. Test the trial batch for workability according to ASTM C1856. Perform the compressive strength test on a set of 3 by 6 inch cylinders after 7, 14, and 28 days, in accordance with ASTM C1856. Each set shall contain at least three samples and all test sets shall be cured similar to that of the trial batch.

5. Submit the results of density (unit weight), flow, rapid chloride ion penetrability, 7 day compressive strength, 14 day compressive strength, and 28 day compressive strength to the Engineer for review and approval a minimum of 10 calendar days prior to the use of the UHPC in the field. To be considered a successful test placement, there shall be no segregation of the UHPC and no visible voids when the forms are removed.

D. Formwork, Casting, and Curing.

1. Forms shall be water tight and coated to prevent the absorption of water and leakage of the mix after placement. The formwork shall be resistant to the hydraulic pressure of the UHPC mix. Fabricate the formwork as recommended or specified by the UHPC Manufacturer after the approval of the Engineer.

2. For batching and casting, follow the procedures and details specified by the UHPC Manufacturer after the approval of the Engineer.

3. Arrange for a representative of the UHPC Manufacturer to be onsite during the entire UHPC placement. The UHPC Manufacturer's representative shall be knowledgeable in the supply, mixing, delivery, placement, and curing of the UHPC material.

4. The mixing equipment that is not supplied by the UHPC Manufacturer shall be reviewed and approved by the Engineer prior to use.

5. For curing, follow the procedures and details specified by the UHPC Manufacturer after the approval of the Engineer.

6. In addition to Article 1105.11, D of the Specifications, limit any loads or vibrations on the spans where the UHPC has been placed until the mix has completed its initial set.

E. Acceptance Testing.

1. The Engineer and the Research Personnel will be on site during the placement of UHPC. Coordination with the Engineer and the Research Personnel shall be made a minimum of 48 hours prior to the anticipated UHPC placement.

2. Provide an appropriate location to place acceptance specimens for initial curing prior to transport to the laboratory. Curing boxes shall be equipped with supplemental heat or cooling as necessary to cure the specimens in accordance with ASTM C1856.

3. Testing shall be performed by the Contractor and approved by the Engineer. The required testing is summarized in the following table. The table contains the test methods, minimum

acceptance criteria, and expected frequencies. Tests may be performed at a more frequent intervals than described below, at the discretion of the Engineer.

Description	Test Method	Acceptance Criteria	Frequency
Flow and Visual Stability	ASTM C1856	8 inches (Minimum) 12 inches (Maximum); No bleed water; Consistent fiber distribution	One per batch
Compressive Strength*	ASTM C1856 (3×6 inch cylinders)	≥ 9 ksi (at 7 days) ≥ 11 ksi (at 14 days) ≥ 12.5 ksi (at 28 days) (150 psi/sec loading rate)	7 day, 14 day**, and 28 day
Rapid Chloride Ion Penetrability***	ASTM C1856 (4×8 inch cylinders)	≤ 300 coulombs	28 day (two per job)

* Each set shall contain at least three samples and all test sets shall be cured similar to that of the field work.
** 14-day compressive test shall be used for acceptance.
*** The samples shall be collected at the time of the flow test before the addition of steel fibers.

150863.04 METHOD OF MEASUREMENT.

A. Measurement of Beam End Repair Ultra-High Performance Concrete (UHPC) will be plan-measured quantity per cubic foot.

B. The quantity for Proprietary UHPC Trial Batch per each includes one trial batch. The Engineer may authorize up to two additional combined trial batches, to be measured and paid per each.

C. The quantity for Proprietary UHPC Test Placement per each includes one test placement. The Engineer may authorize up to two additional combined test placements, to be measured and paid per each.

150863.05 BASIS OF PAYMENT.

A. Payment will be for the contract unit price of Beam End Repair Ultra-High Performance Concrete (UHPC) per cubic foot. Payment is full compensation for furnishing all submittal, materials, labor, testing, results, formwork and incidental work for completion of the beam end repair as indicated in this special provision and the contract documents.

B. Payment will be for the contract unit price for Proprietary UHPC Trial Batch per each trial batch. Payment is full compensation for furnishing all submittal, materials, labor, testing, results, and incidental work for completion of the trial mix as indicated in this special provision and the contract documents.

C. Payment will be for the contract unit price for Proprietary UHPC Test Placement per each test placement. Payment is full compensation for furnishing all submittal, materials, forms, labor, and incidental work for completion of the trial placement as indicated in this special provision and the contract documents.