

CONTRACTOR-FABRICATED PRECAST CONCRETE STRUCTURE
(CONCRETE/STEEL PIER CAP)

**** From New Haven BRF 0183(1)**

- xx. DESCRIPTION. This work shall consist of manufacturing, transporting, and erecting a precast concrete/steel composite pier cap unit at a location other than a Precast Concrete Institute (PCI) or National Precast Concrete Association (NPCA) certified precast concrete facility as shown on the Plans.

The work under this Section shall be performed in accordance with these provisions, the Plans, and referenced sections of the Standard Specifications.

- xx. MATERIALS. Materials shall meet the requirements of Subsections 501.02, 506.02, 507.02, 540.02 and 707.03.

- (a) Concrete. Concrete shall meet the requirements of Subsection 540.05, with the exception that the requirements of part (a) do not apply. In lieu of a mix meeting the requirements of Subsection 540.05, the Contractor may provide a mix meeting the requirements of Section 501 for Concrete, High Performance Class A or Concrete, High Performance Class B, provided that the design strength as shown in the Plans as well as that required for lifting and handling is met.

- xx. GENERAL FABRICATION REQUIREMENTS. The structural steel furnished under this Section shall be fabricated in a plant meeting the requirements of Subsection 506.03. After fabrication, the structural steel shall be transported to an approved site, where the remainder of the precast concrete/steel composite pier cap unit shall be fabricated.

Structural steel fabrication shall be done in accordance with Section 506.

Unless noted otherwise herein, Contractor-fabricated Precast Concrete (CFPC) produced and paid under this Special Provision shall meet the requirements of Sections 501, 507, and 540.

Concrete shall not be deposited in the forms until the Agency representative has approved placement of the reinforcement and inserts.

The unit shall not be shipped until the minimum 28-day strength is attained and it has been approved by the Agency. A 48-hour advance notice of the loading and shipping schedule shall be provided. The unit shall be secured on the vehicle in order that no cracking will occur during transport. The Contractor shall secure the necessary hauling permits.

- xx. Fabrication Drawings. The Fabricator(s) shall submit Fabrication plans and working drawings for the precast concrete/steel composite integral pier cap unit, including, but not limited to, precast concrete, reinforcing steel, structural steel, shear connectors, post-tensioning system components, lift points and their reinforcement, handling

procedures and erection plans and procedures in accordance with Subsection 105.03, to include the information requirements specified in Subsections 506.04 and 540.04.

A complete copy of the structural design calculations for the CFPC shall be submitted as Construction Drawings in accordance with Section 105. The design calculations shall substantiate that the proposed precast concrete satisfies the design parameters of the Contract. The applicable design code will be the latest edition of the AASHTO LRFD Bridge Design Specifications unless indicated otherwise in the Contract Documents.

Fabrication Drawings for the precast concrete shall be submitted in accordance with Section 105, with an additional copy to the Composite Materials Engineer. In addition to the requirements for Fabrication Drawings in Section 105, the following shall be included:

- (a) Dimensions and tolerances of the precast concrete to be fabricated.
- (b) The concrete mix design, including but not limited to the following:
 - (1) Batch weights specifying dry or saturated surface dry.
 - (2) Material names and sources.
 - (3) Aggregate properties and date tested.
 - (4) Chemical and physical properties of cementitious material.
 - (5) Admixture names and sources.
 - (6) Lab data that shall include, but not be limited to:
 - a. Slump.
 - b. Air Content.
 - c. Temperature.
 - d. Ratio of Water/Cementitious Material.
 - e. Cylinder breaks for 3, 7, and 28 days cured in the same manner as the piece to be fabricated.
 - f. 56-day Rapid Chloride Ion Permeability - AASHTO T 277 test data. The results shall be the average from testing 3 specimens, but the individual specimen results shall also be included. Testing shall be performed by an independent laboratory accredited by AMRL in this test method.
 - g. Alkali-Silica Reactivity (ASR) - AASHTO T 303 data from testing of both the fine and coarse aggregates. Testing shall be performed by an independent laboratory accredited by AMRL in this test method.

- (7) Alkali-Silica Reactivity (ASR). If potentially reactive aggregates are to be used in a mix design, then proposed mitigation method(s) and test results must be provided. The AASHTO T 303 test must be run again with the proposed mitigation method(s) and using the proposed job cementitious material proportioning. The proposed mitigation method(s) shall reduce expansion to below 0.10%.

If a mix design, including the testing results, has been submitted and approved within a 12 month period, it may be used in lieu of submitting an additional mix design. However, if any change in the material sources, properties, or proportions has occurred, then a new mix design with lab test data will be required regardless of previous approval.

The requirements for testing in Subsections 540.04(b)(6)f, 540.04(b)(6)g, and 540.04(b)(7) above shall be waived if the submitted mix design has a minimum proportion of the cementitious material content of that allowed for use in High Performance Concrete in Section 501.

The mix design shall be approved by the Composite Materials Engineer prior to fabrication.

- (c) The sources and properties of the materials proposed for use.
- (d) The placement of reinforcing steel, welded wire fabric, mechanical bar connectors, and inserts.
- (e) The type of surface finish and how the finish will be obtained. Include details of potential repair procedures.
- (f) The curing method, detailing sequence, and duration.
- (g) The minimum required concrete strength for design strength and form removal.
- (h) The design of the lifting attachments.
- (i) Transportation, handling, and storage details.
- (j) The installation procedures, including a detailed grouting procedure.
- (k) A Quality Control Plan that identifies a Quality Control Manager and provides previous experience for work of this nature. A Description of Quality Control Processes addressing but not limited to:
 - (1) Concrete production including batching, delivery, and placement.
 - (2) Formwork.
 - (3) Reinforcing.

- (4) Concrete finishing.
- (5) Concrete cure.
- (6) Shipping/Installation procedures.

Detailed handling, lifting and shipping procedures shall be developed. The procedures will clearly identify the method of lifting and supporting the steel elements during the precast concrete operations so as not to effect the girder alignment, camber, coatings, etc. The procedures shall define the correct lifting, handling and shipping of the composite unit or its constituents at all stages of fabrication, and erection.

The Contractor shall have an Engineer responsible for ensuring that all of the components of the precast concrete/steel composite unit are coordinated between the steel fabricator and the contractor. The Engineer shall verify the design, detailing, and fabrication of all components of the work to ensure that proper fit up is achieved. Steel and precast fabrication drawings shall be submitted in a combined submittal to the Engineer prior to submission to the Agency. Common geometry control shall be established between the fabrication drawings.

The Contractor's Engineer is responsible for a documented review including a QA sign off of all plans, procedures, and shop drawings to ensure interfaces between the various elements are not in conflict and are in accordance with design documents.

The Contractor's Engineer shall have independent survey checks performed to ensure proper alignment of the pier cap in the field.

- xx. INSPECTION. Materials furnished and the work performed herein shall be inspected by the Agency. The Agency will test all concrete incorporated into the work in accordance with Section 501. The inspector shall have the authority to reject any material or work that does not meet the requirements of the Specifications. Advance notification of at least two (2) weeks shall be provided by the Contractor to the Agency's Engineer and the Composite Materials Engineer concerning the proposed intention to commence work. A minimum of five (5) working days notification shall be provided by the Contractor to the Agency's

Engineer and the Composite Materials Engineer to confirm the fabrication start date.

Prior to placing any precast concrete elements produced under these Specifications, all materials shall have all applicable certifications approved in accordance with Subsection 700.02.

- xx. FABRICATION/INSTALLATION.

- (a) Pre-Production Meeting. Unless the Engineer deems, in writing, that a pre-production meeting is unnecessary, then a pre-production meeting shall be held a minimum of seven (7) calendar days prior to beginning concrete placement. The pre-production meeting shall be attended by, as a minimum but not limited to, the Crew Supervisor, Contractor Project Manager, Concrete Producer, Resident Engineer, Project Manager, and Composite

Materials Engineer.

- (b) Fabrication Sequence. Fabricate all steel superstructure components at steel fabrication plant. Erect steel beams and all diaphragms on temporary blocking and match drill the girder splice plates. Reassemble the complete 2 span superstructure unit on temporary blocking at precast location. Install rebar and removable forms for the precast composite pier cap beam.
- (c) Placing Concrete. Concrete placement shall be in accordance with Subsection 501.10 and as specified herein. Concrete shall not be deposited in the forms until the appropriate Agency representative has approved placement of the reinforcement, conduits, and anchorages.
- (d) Repairs/Patching. CFPC structure components that contain minor defects caused by manufacture or handling may be repaired at the manufacturing site. Minor defects are defined as holes, honeycombing, or spalls which are 150 mm (6 inches) or less in diameter and that do not penetrate deeper than 25 mm (1 inch) into the concrete. Surface voids or "bugholes" that are less than 16 mm (5/8 inch) in diameter and less than 6 mm (1/4 inch) deep need not be repaired. Repairs shall be made using a material from the Agency's Approved Products List for overhead and vertical concrete repair. The repair material shall be cured as specified by the manufacturer. Repairs shall be approved by the Engineer.
- (e) Cracking. Cracks less than 0.25 mm (0.01 inch) in width shall be sealed by a method approved by the Engineer. Cracks in excess of 0.25 mm (0.01 inch) may be cause for rejection. At the Engineer's discretion, cracked CFPC structure components shall be repaired or replaced at the Contractor's expense.
- (f) Sealing of Lifting Holes. After the unit is in its final location, a bonding agent shall be applied and the lifting holes filled with cementitious polymer shrinkage compensated grout. A removable form shall be provided at the bottom surface of the deck to retain the grout.
- (g) Marking. The date of manufacture, the production lot number, and the piece mark shall be clearly marked on each individual piece of precast concrete. The mark shall be in a location that will not be visible in the finished product.
- (h) Tolerances. Contractor's Engineer to define tolerances and include in fabrication drawings to be approved by the Engineer.
- (i) Structural Steel. All diaphragms and other structural steel work shall be installed as shown on the approved Erection Plan after the unit is in its final location.
- (j) Erection Plan. Cranes, lifting devices, and other equipment for erecting the precast concrete/steel composite pier cap unit shall be of adequate design and capacity to safely erect, align, and secure all members and components in their final positions without damage. The Contractor is solely responsible for the

methods and equipment employed for the erection of the precast concrete/steel composite pier cap unit.

The Contractor shall submit Construction Drawings in accordance with Section 105 for the methods and sequence of precast concrete/steel composite pier cap unit erection, the temporary bracing, and the equipment to be used for the erection. The erection plan shall include the necessary computations to indicate the magnitude of stress in the unit during erection and to demonstrate that all of the erection equipment has adequate capacity for the work to be performed. The erection plan shall contain provisions for all stages of construction, including temporary stoppages.

- (k) Unit Erection. Erection of the unit shall not proceed until substructure concrete has been cured for the minimum length of time specified in Subsection 501.17. The unit shall be installed to the correct line and grade as shown on the approved drawings and as indicated in the approved erection procedure. After the unit is erected, it shall be inspected to ensure the correctness of its location.
- (l) Loading. The unit may not be loaded until joint material has properly and finally cured and as approved by the Engineer. The grout shall be cured in accordance with the manufacturer's instructions until design strength has been met.
- (m) Final Repairs. After the installation work is complete, remaining holes for inserts, and lifting holes shall be repaired as indicated in Specification 540.11.
- (n) Grout. Contractor to submit product data sheet and grouting procedure for approval by the Engineer.
- (o) Technical Assistance. The Contractor shall have their Engineer as required above, available during the erection of the precast concrete/steel composite pier cap unit to provide technical assistance to the Contractor in the event unusual problems or special circumstances arise.

xx. HANDLING, STORAGE, AND SHIPPING. The CFPC structure shall be handled, stored, and shipped in such a manner as to minimize chipping, cracks, fractures, discoloration, and excessive bending stresses. A unit damaged by handling, storage, or shipping shall be replaced at the Contractor's expense.

The CFPC structure shall not be installed until the respective unit has been inspected. This inspection shall verify that the pieces are free from defects, and that all specification requirements, including but not limited to those for compressive strength and tolerance requirements, have been achieved. In addition, a CFPC structure will not be considered for shipment until the completion of the cure period and the required strength has been attained as demonstrated by field-cured cylinder breaks.

xx. METHOD OF MEASUREMENT. The quantity of Special Provision (Contractor-

Fabricated Precast Concrete Structure)(Concrete/Steel Pier Cap)to be measured for payment will be Lump Sum (LS) installed in the complete and accepted work.

- xx. BASIS OF PAYMENT. The accepted quantity of Special Provision (Contractor-Fabricated Precast Concrete Structure)(Concrete/Steel Pier Cap)will be paid for at the Contract Lump Sum price. Payment will be full compensation for detailing, fabricating, repairing, quality control testing, transporting, handling, and installing the materials specified, including concrete, reinforcing steel, grout, corrugated sleeves, structural steel, shear studs, connectors, and shims; for designing and installing lift brackets and any other material contained within or attached to the members; for any grouting work required; for furnishing and implementing the erection plan; and for furnishing all labor, tools, equipment, and incidentals necessary to complete the work.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
900.645 Special Provision (Contractor-Fabricated Precast Concrete Structure)(Concrete/Steel Pier Cap)	Lump Sum