



# Iowa Department of Transportation

## SPECIAL PROVISIONS FOR PREFABRICATED SUPERSTRUCTURE MODULES

Pottawattamie County  
BRF-006-1(114)--38-78

Effective Date  
February 15, 2011

**THE STANDARD SPECIFICATIONS, SERIES 2009, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE SPECIAL PROVISIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.**

### **090111.01 DESCRIPTION.**

- A.** Furnish, erect, and install prefabricated superstructure modules including interior superstructure module 1, interior superstructure module 2, exterior superstructure module 1 and exterior superstructure module 2, herein referred to as module(s), for bridges including all necessary materials and equipment to complete the work as shown on the plans. The modules shall be prefabricated using a concrete decked steel stringer system as shown in the plans. Use of cast-in-place construction will not be considered for substitution.
- 1. Interior Superstructure Module 1.**  
Includes steel girders, stiffeners, diaphragms, tie plates, shear studs, lifting anchors, hardware, connectors, shear keys, steel sole plates, neoprene pads, elastomeric bearings, anchor bolts, grout, precast concrete deck, precast concrete backwall, epoxy-coated reinforcing, UHPC vertical and longitudinal closure pours.
  - 2. Interior Superstructure Module 2.**  
Includes steel girders, stiffeners, diaphragms, shear studs, lifting anchors, hardware, connectors, steel sole plates, neoprene pads, elastomeric bearings, anchor bolts, grout, precast concrete deck, epoxy-coated reinforcing, and UHPC transverse and longitudinal closure pours.
  - 3. Exterior Superstructure Module 1.**  
Includes steel girders, stiffeners, diaphragms, tie plates, shear studs, lifting anchors, deck drains with supports and connectors, flange deflectors, hardware, connectors, shear keys, steel sole plates, neoprene pads, elastomeric bearings, anchor bolts, grout, precast concrete deck, precast concrete backwall, epoxy-coated reinforcing, and barriers.
  - 4. Exterior Superstructure Module 2.**  
Includes steel girders, stiffeners, diaphragms, shear studs, lifting anchors, deck drains with supports and connectors, hardware, connectors, steel sole plates, neoprene pads, elastomeric bearings, anchor bolts, grout, precast concrete deck, epoxy-coated reinforcing, barriers, UHPC transverse closure pours, and UHPC barrier closure pours.

- B.** Apply Sections 2403, 2404, 2407, 2408, 2412, 2513, and Divisions 11 and 41 of the Standard Specifications with the following modifications.

**C. Submittals.**

The submittals requiring written approval from the Engineer are as follows:

**1. Assembly Plan.**

- a.** Prepare the assembly plan under the seal of a Professional Engineer licensed in the State of Iowa. Place the title block with project information (similar to plans title block) in the lower right-hand corner of each sheet. Submit 7 sets of half-size, 11 inch by 17 inch sheets with a 1 1/2 inch blank margin on the left-hand edge, for approval 28 days before fabrication.
- b.** The assembly plan shall include, but not necessarily be limited to, the following:
- A work area plan, depicting utilities overhead and below the work area, drainage inlet structures, protective measures, etc.
  - Details of all equipment that will be employed for the assembly of the superstructure.
  - Details of all equipment to be used to lift modules including cranes, excavators, lifting slings, sling hooks, jacks, etc. Include crane locations, operation radii, lifting calculations, etc.
  - Computations to indicate the magnitude of stress in the modules during erection and to demonstrate that all of the erection equipment has adequate capacity for the work to be performed.
  - Detailed sequence of construction and a CPM schedule for all operations. Account for setting and cure time for any grouts and concrete closure pours.
  - Methods of providing temporary support of the modules. Include methods of adjusting, bracing and securing the module after placement.
  - Procedures for controlling tolerance limits.
  - Methods for leveling any differential camber between adjacent modules prior to placing closure pour.
  - Methods of forming closure pours and sealing lifting holes.
  - Methods for curing grout, closure pour, and lifting hole concrete.
  - Method for diamond grinding to achieve deck profile and longitudinal grooving.

**2. Shop Drawings for Modules.**

- a.** Prepare shop drawings under the seal of a Professional Engineer licensed in the State of Iowa. Place the title block with project information (similar to plans title block) in the lower right-hand corner of each sheet. Submit 7 sets of half-size, 11 inch by 17 inch sheets with a 1 1/2 inch blank margin on the left-hand edge, for approval 28 days before fabrication.
- b.** The shop drawings shall include, but not necessarily be limited to, the following:
- Show all lifting inserts, hardware, or devices and locations on the shop drawings for Engineer's approval.
  - Show locations and details of the lifting devices and lifting holes including supporting calculations, type, and amount of any additional precast concrete reinforcing required for lifting.
  - Show any leveling inserts in the deck and include the leveling procedure for modules.
  - Show minimum compressive strength attained for precast concrete deck and concrete traffic rail prior to handling the modules.
  - Show details of structural steel, shear connectors and bearing assemblies as well as elastomeric bearing pads.
- c.** Do not order materials or begin work until receiving final approval of the shop drawings. The Contracting Authority will reject any module fabricated before receiving written approval, or any modules that deviate from the approved drawings. The Contractor shall be responsible for costs incurred due to faulty detailing or fabrication.

**3. Concrete Requirements.**

Submit ultra-high performance concrete mix designs to the engineer for approval.

**4. Defects and Breakage of Precast Concrete Deck and Concrete Traffic Rail.**

Submit proposed written repair procedures for approval.

**090111.02 MATERIALS.****A. Concrete.**

1. Precast deck: High performance concrete shall conform to Section 2407 in the Standard Specifications and as required in the plans. Site-casting shall conform to the Alternate Site Casting provisions listed in the plans and materials must be approved by the District Materials Engineer prior to any module fabrication.
2. Precast rail: High performance concrete shall conform to Section 2407 in the Standard Specifications and as required in the plans. Site-casting shall conform to the Alternate Site Casting provisions listed in the plans and materials must be approved by the District Materials Engineer prior to any module fabrication.
3. Closure Pour and Lifting Hole Concrete: Conform to Special Provisions for Ultra High Performance Concrete.

**B. Reinforcing Steel.**

Use epoxy coated reinforcing steel. Conform to Section 2404 of the Standard Specifications.

**C. Structural Steel.**

Conform to Section 2408 of the Standard Specifications and as required in the plans. Shear studs shall conform to I.M 453.10.

**D. High-Strength Bolts, Nuts, and Washers.**

Conform to Section 2408 and Section 4153.06, B, of the Standard Specifications and as required in the plans.

**E. Welding.**

Conform to Section 2408 of the Standard Specifications and as required in the plans.

**F. Elastomeric Bearing Pad.**

Conform to Section 4195 of the Standard Specifications and as required in the plans.

**G. Neoprene Pad.**

Leveling pads shall be of 60 durometer neoprene, conform to Section 4195 of the Standard Specifications and as required in the plans.

**090111.03 CONSTRUCTION.****A. Quality Assurance.**

1. Modules shall be provided by a fabricator with experience in the manufacture of decked steel stringer modules, or similar products, satisfactory to the Contracting Authority and shall provide documentation demonstrating adequate staff, appropriate forms, experienced personnel and a quality control plan. Equipment, procedures and quality of concrete shall have been approved by the Contracting Authority prior to letting per Materials I.M. 445. Site-casting shall conform to the Alternate Site Casting provisions listed in the plans and procedures must be approved by the District Materials Engineer prior to any module fabrication.

2. Permanently mark each module with date of fabrication, supplier identification and module identification. Stamp markings in fresh concrete.
3. Prevent cracking or damage of precast concrete deck and concrete traffic rail during handling and storage.
4. Replace defects and breakage of precast concrete deck and concrete traffic rail according to the following:
  - Modules that sustain concrete damage or surface defects during fabrication, handling, storage, hauling, or erection are subject to review or rejection.
  - Obtain approval before performing concrete repairs.
  - Concrete repair work must reestablish the module's structural integrity, durability, and aesthetics to the satisfaction of the Engineer.
  - Determine the cause when damage occurs and take corrective action.
  - Failure to take corrective action, leading to similar repetitive damage, can be cause for rejection of the damaged module.
  - Cracks that extend to the nearest reinforcement plane and fine surface cracks that do not extend to the nearest reinforcement plane but are numerous or extensive are subject to review and rejection.
5. Modules will be rejected for any of the following reasons:
  - Fabrication not in conformance with the contract documents.
  - Full depth cracking of concrete and concrete breakage that is not repairable to 100% conformance to the actual product are cause for rejection.
  - Camber that does not meet the requirements required by the plans or shop drawings.
  - Honeycombed texture.
  - Dimensions not within the allowable tolerances specified in the contract documents.
  - Defects that indicate concrete proportioning, mixing and molding not conforming to the contract documents.
  - Damaged ends, preventing satisfactory joint.
  - Damage during storage, transportation, erection, or construction determined to be significant by the Engineer.
6. Construct modules to the following tolerances:
  - Deck surfaces must meet a 1/8 inch in 10-foot straightedge requirement in longitudinal and transverse directions.
  - Control of camber during fabrication is required to achieve ride quality. Differences in camber between adjacent modules shall not exceed 1/4 inch before shipping to the site. Establish the differential camber by pre-assembling the modules as required herein.
7. The plant (or fabricator) will document all test results for module structural concrete. The quality control file will contain at least the following information:
  - Module identification
  - Date and time of fabrication of concrete pour
  - Concrete cylinder test results
  - Quantity of used concrete and the batch printout
  - Form-stripping date and repairs if applicable
  - Location/number of blockouts and lifting inserts
  - Temperature and moisture of curing period
  - Document lifting device details, requirements, and inserts

**B. Fabrication.**

1. Precast concrete deck shall conform to Section 2407 of the Standard Specifications. Site-casting shall conform to the Alternate Site Casting provisions listed in the plans and materials and procedures must be approved by the District Materials Engineer prior to any module fabrication.
2. Precast deck forms shall be well constructed, carefully aligned, clean, substantial, and firm, and securely placed and fastened together to provide a level, true riding surface. The module supports and deflection control shall be checked prior to pouring and monitored throughout the pouring process. Holes, cutouts, anchorage, reinforcement, and any other related details shown on the plans shall be provided for in the modules.
3. Do not place concrete in the forms until the Engineer has inspected the form and has approved all materials and the placement of the materials in the form.
4. Provide the Engineer a tentative casting schedule at least two weeks in advance to make inspection and testing arrangements. A similar notification is required for the shipment of modules to the job site.
5. Finish the precast concrete deck according to Section 2407 of the Standard Specifications. The top surface (wearing surface) of the precast deck shall have a texture applied conforming to Section 2301.03, H, 2, of the Standard Specifications.
6. Forms shall not be removed until the concrete has reached the required minimum compressive strength of 5000 psi.
7. The prefabricated superstructure shall be pre-assembled to assure proper match between modules to the satisfaction of the Engineer before shipping to the job site. The procedure for leveling any differential camber shall be established during the pre-assembly and approved by the engineer. The modules shall be matched as closely as possible for camber, and match-marked. Dimensions shall be provided to the Contractor for setting precast substructure elevations.
8. The modules should be measured for sweep and the bearing anchor bolt locations reconfigured as needed. Anchor bolts may be cast into the precast substructure, or at the Contractor's option drilled and grouted into the precast substructure, at no additional cost to the Contracting Authority.

**C. Handling, Storing, and Transportation.**

1. **Handling and Storing.**
  - a. Follow Chapter 5 of the PCI Design Handbook for handling and erection bracing requirements.
  - b. Modules damaged during handling and storage will be repaired or replaced at the Contract Authority's direction at no cost to the Contract Authority.
  - c. Modules shall be lifted at the designated points by approved lifting devices properly attached to the module and proper hoisting procedures. The Contractor is responsible for handling stresses in the modules and shall include all necessary precast concrete modifications to resist handling stresses on the shop drawings. The Contracting Authority may institute an instrumentation program to monitor handling and erection stresses in the modules. The costs for the instrumentation and monitoring, if performed, will be paid for separately by IADOT and are not included in the bid prices for the modules. The contractor shall provide the necessary cooperation for the instrumentation program.

- d. Storage areas shall be smooth and well compacted to prevent damage due to differential settlement.
- e. Modules shall be protected from freezing temperatures (32°F) for 5 days or until precast concrete attains design compressive strength detailed on the plans, whichever comes first. Do not remove protection any time before the units attain the specified compressive strength when the surrounding air temperature is below 20°F.
- f. Modules may be loaded on a trailer as described above. Shock-absorbing cushioning material shall be used at all bearing points during transportation. Tie-down straps shall be located at the lines of blocking only.
- g. The modules shall not be subject to damaging torsional, dynamic, or impact stresses.

**2. Transportation.**

- a. A module shall not be transported from the casting yard until the precast concrete attains the minimum 28 day compressive strength specified in the project plans as shown by test cylinders cured in accordance with AASHTO T 23, and a minimum of 7 days has elapsed from casting of the precast concrete.
- b. A 48-hour notice of the loading and shipping schedule shall be provided to the Contracting Authority.
- c. Transport modules horizontal with steel beams on bottom side for support. Support the modules at approximately the same points they will be supported when installed.
- d. Material, quality and condition after shipment will be inspected after delivery to the construction site, with this and any previous inspections constituting only partial acceptance.

**D. General Procedure for Installation of Modules.**

- 1. Do not place modules on precast substructure until the compressive test results for the precast substructure connections have reached the required minimum values.
- 2. Survey the top elevation of the precast concrete substructures. Establish working points, working lines, and benchmark elevations prior to placement of all modules.
- 3. Clean bearing surface before modules are erected.
- 4. Lift and erect modules using lifting devices as shown on the shop drawings in conformance with the assembly plans.
- 5. Set module in the proper location. Survey the top elevation of the modules. Check for proper alignment and grade within specified tolerances. Approved neoprene pads shall be used between the bearing and the girder to compensate for minor differences in elevation between modules and approach elevations. Follow match-marks.
- 6. Temporarily support, anchor, and brace all erected modules as necessary for stability and to resist wind or other loads until they are permanently secured to the structure. Support, anchor, and brace all modules as detailed in the assembly plan.
- 7. Differences in camber between adjacent modules shipped to the site shall not exceed 1/4 inch. If there is a differential camber the contractor shall apply dead load to the high beam to bring it within the connection tolerance. A leveling beam can also be used to equalize camber. The leveling procedure shall be demonstrated during the pre-assembly process prior to shipping to the site. The assembly plan shall indicate the leveling process to be applied in the field. If a leveling beam is to be used, have available a leveling beam and suitable jacking assemblies for attachment to the leveling inserts of adjacent modules. Equip all modules with leveling inserts for field adjustment or equalizing of differential camber. The inserts with threaded ferrules are cast in the deck, centered over the beam's web. A minimum tension capacity of 5500 lbs is required for the inserts.

8. Saturate surface dry (SSD) all closure pour surfaces prior to connecting the modules.
9. Form closure pours and seal lifting holes as required by the approved assembly plan. The closure pour forms and the sealed lifting holes shall be free of any material such as oil, grease, or dirt that may prevent bonding of the joint.
10. Cast UHPC closure pours and fill lifting holes with UHPC as shown on the plans. Cure closure pours and lifting holes.
11. Remaining concrete defects and holes for inserts shall be repaired as required by the Engineer.
12. Do not apply superimposed dead loads or construction live loads to the prefabricated superstructure until the compressive test result of the cylinders for the UHPC closure pour concrete has reached the specified minimum compressive strength of 14 KSI.

**E. Diamond Grind Bridge Deck.**

1. Diamond grind the bridge deck for profile improvement as required by the plans, in conformance with Section 2532 of the Standard Specifications. Diamond grinding of the bridge deck shall not begin until the UHPC closure pour concrete has reached the specified minimum compressive strength of 14 KSI.
2. Contractor to bid diamond grinding based on the type of coarse aggregate in the concrete mix for bridge decks. For plant precasting of ABC components, coarse aggregate shall be in accordance with Section 2407 of the Standard Specifications. For alternate fabrication of ABC components at a temporary casting facility, coarse aggregate shall be in accordance with the Developmental Specification for High Performance Concrete for Structures (Council Bluffs System).

**F. Saw Cut Groove Texture Finish.**

Saw cut longitudinal grooves into top of bridge deck using a mechanical cutting device after diamond grinding. Saw cutting grooves shall conform to Section 2412.03, D, 4, of the Standard Specifications.

**090111.04 METHOD OF MEASUREMENT.**

**A. Interior Superstructure Module 1.**

The Engineer will determine the number of interior superstructure modules 1 from actual count (Each).

**B. Interior Superstructure Module 2.**

The Engineer will determine the number of interior superstructure modules 2 from actual count (Each).

**C. Exterior Superstructure Module 1.**

The Engineer will determine the number of exterior superstructure modules 1 from actual count (Each).

**D. Exterior Superstructure Module 2.**

The Engineer will determine the number of exterior superstructure modules 2 from actual count (Each).

**090111.05 BASIS OF PAYMENT.**

**A. Interior Superstructure Module 1.**

Payment will be full compensation for the manufacturing, furnishing, and placement of each interior superstructure module 1. All items required to assemble each interior superstructure module 1 into a prefabricated superstructure per the plans, including labor, materials and equipment, shall be considered incidental to this item and will not be paid for separately.

**B. Interior Superstructure Module 2.**

Payment will be full compensation for the manufacturing, furnishing, and placement of each interior superstructure module 2. All items required to assemble each interior superstructure module 2 into a prefabricated superstructure per the plans, including labor, materials and equipment, shall be considered incidental to this item and will not be paid for separately.

**C. Exterior Superstructure Module 1.**

Payment will be full compensation for the manufacturing, furnishing, and placement of each exterior superstructure module 1. All items required to assemble each exterior superstructure module 1 into a prefabricated superstructure per the plans, including labor, materials and equipment, shall be considered incidental to this item and will not be paid for separately.

**D. Exterior Superstructure Module 2.**

Payment will be full compensation for the manufacturing, furnishing, and placement of each exterior superstructure module 2. All items required to assemble each exterior superstructure module 2 into a prefabricated superstructure per the plans, including labor, materials and equipment, shall be considered incidental to this item and will not be paid for separately.