



## Iowa Department of Transportation

### SPECIAL PROVISIONS FOR PREFABRICATED SUPERSTRUCTURE MODULES

Pottawattamie County  
BRF-092-1(64)--38-78

Effective Date  
December 16, 2014

**THE STANDARD SPECIFICATIONS, SERIES 2012, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE SPECIAL PROVISIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.**

#### **120243.01 DESCRIPTION.**

- A.** Furnish, erect, and install prefabricated superstructure modules including Superstructure Module, M50 – Exterior, Superstructure Module, M50 – Interior, Superstructure Module, M90 – Exterior, and Superstructure Module, M90 – Interior, herein referred to as module(s). This work includes all necessary materials and equipment to complete the work as shown in the plans. The modules shall be prefabricated using a concrete decked steel beam system as shown in the plans. Use of cast-in-place construction will not be considered for substitution.
- B.** Apply Sections 2403, 2404, 2407, 2408, 2412, 2513, and Division 41 of the Standard Specifications with the following modifications.
- C. Submittals.**  
Submittals shall be provided to the Office of Bridges and Structures in electronic format, in accordance with Article 1105.03, F of the Standard Specifications.

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

- 1. Module Fabrication Plan.**
  - a.** Submit the Module Fabrication Plan for approval 28 days before construction of modules.
  - b.** The Module Fabrication Plan shall pertain to construction operations during assembly of the steel framing and construction of the precast deck. The Module Fabrication Plan shall include, but shall not necessarily be limited to, the following:
    - Name of firm(s) and associated personnel that will be supervising and performing module fabrication. Experience record of firm(s) and associated personnel relative to fabrication of decked steel modules, or similar products.
    - Location and description of fabrication site, including a diagram of the work area.
    - Details of all equipment that will be employed for the construction of the modules.
    - Details of temporary supports and bracing used during framing and deck placement.

- Detailed sequence of construction for all module framing and deck placement operations, and proposed schedule, including minimum waiting periods for curing, form stripping, transporting and loading.
- Quality control plan pertinent to module fabrication.

**2. Assembly Plan.**

- a. Prepare the Assembly Plan under the seal of a Professional Engineer licensed in the State of Iowa. Submit the Assembly Plan for approval 28 days before erection of modules.
- b. The Assembly Plan shall pertain to construction operations including handling, lifting, placing, supporting and securing the prefabricated superstructure modules. The Assembly Plan shall include, but not necessarily be limited to, the following:
  - A work area plan, depicting temporary and permanent structures, haul roads, utilities and other temporary or permanent site features relevant to module assembly.
  - 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.
  - Details of lifting devices and/or attachment points, with computations to demonstrate that all lifting devices have adequate capacity to resist lifting stresses.
  - Construction load analyses, including computations to indicate the magnitude of stress in the modules during construction. The Contractor shall be responsible for demonstrating that all components to be lifted have adequate capacity to resist lifting stresses, and 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 substructure components and superstructure closure pours.
  - Methods and details for temporary support of the modules. Include methods of adjusting, bracing and securing the module after placement.
  - Methods and details of temporary support of the substructure, as required for the Contractor's proposed module placement procedures. Contractor shall be responsible for the stability of the substructure during all construction operations.
  - Procedures for controlling horizontal and vertical tolerance limits. Include details of any alignment brackets, jigs, templates, shims, leveling pads, etc.
  - Methods for leveling any differential camber between adjacent modules prior to placing closure pour.
  - Methods and procedures for removing and patching lifting devices, attachment points, leveling devices and other inserts/blockouts, as applicable.

**3. Shop Drawings for Superstructure Modules.**

- a. Prepare shop drawings under the seal of a Professional Engineer licensed in the State of Iowa. Submit the shop drawings for approval 28 days before fabrication of module components.
- b. The shop drawings shall include, but not necessarily be limited to, the following:
  - Show details of structural steel, shear connectors, bearing assemblies and reinforced neoprene bearing pads.
  - Show minimum compressive strength attained for precast concrete deck rail prior to handling of the modules.
  - Show all lifting devices and/or attachment points on the shop drawings for Engineer's review and approval. Provide design details of lifting devices and/or attachment points demonstrating sufficient capacity to accommodate proposed lifting procedures. Provide details of any auxiliary precast concrete reinforcing required for lifting operations. Provide removal details for lifting devices and/or attachment points that interfere with future construction activities. Provide patching details for lifting device

and/or attachment point pockets/blockouts within reinforced concrete deck, as applicable.

- Show all leveling inserts, as applicable. Provide design details of leveling inserts demonstrating sufficient capacity to accommodate proposed leveling procedures. Provide removal/patching details for lifting inserts within reinforced concrete deck, as applicable.
- 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.

**4. Concrete Requirements.**

Submit concrete mix designs to the Engineer for approval.

**5. Defects and Breakage of Precast Concrete Deck.**

Submit proposed written repair procedures for approval.

**120243.02 MATERIALS.**

**A. Concrete.**

**1. Fabrication Plant Casting.**

Concrete materials for precast deck constructed at preapproved fabrication plant shall be in accordance with Section 2407 of the Standard Specifications, with a minimum 28-day compressive strength of 5.0 KSI. Concrete mix design must be approved by the District Materials Engineer prior to any module fabrication.

**2. Alternate Site Casting.**

Concrete materials for precast deck constructed in accordance with "Alternate Site Casting Notes" in design plans shall conform to Developmental Specifications for High Performance Concrete for Structures, with a minimum 28-day compressive strength of 5.0 KSI. Concrete mix design must be approved by the District Materials Engineer prior to any module fabrication.

**B. Reinforcing Steel.**

Reinforcing for modular deck shall be stainless steel. Conform to design plans and Article 4151.03, D of the Standard Specifications.

**C. Structural Steel.**

Conform to design plans and Section 2408 of the Standard Specifications. Shear studs shall conform to Materials I.M. 453.10.

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

Conform to design plans and Section 2408 and Article 4153.06, B, of the Standard Specifications.

**E. Welding.**

Conform to design plans and Section 2408 of the Standard Specifications.

**F. Laminated Neoprene Bearing Pads.**

Conform to design plans and Section 4195 of the Standard Specifications.

**G. Neoprene Leveling Pads.**

Leveling pads shall be 60 durometer neoprene. Conform to design plans and Section 4195 of the Standard Specifications.

### **120243.03 CONSTRUCTION.**

#### **A. Quality Assurance.**

1. Modules shall be provided by a fabricator with experience in the manufacture of decked steel beam modules, or similar products, satisfactory to the Contracting Authority. Fabricator shall provide documentation demonstrating adequate staff, experience, equipment and quality control. Modules shall be constructed by a preapproved fabricator at a preapproved facility, in accordance with Materials I.M. 445, except as permitted in the "Alternate Site Casting Notes" in the design plans.
2. Each module shall be permanently marked with date of fabrication, supplier identification and unique module identification. Markings shall be readily visible for purposes of inspection and erection.
3. Modules shall be prevented from cracking, damage, or creep-induced deformation during storage and handling.
4. Repair defects and/or damage to precast concrete deck in accordance with the following:
  - Notify Engineer of suspected defects and/or damage. Modules that exhibit defects and/or damage may be subject to review or rejection by the Engineer.
  - Submit repair procedures to Engineer for review and approval. Do not proceed with repair without written approval from the Engineer.
  - Concrete repair work must reestablish the module's structural integrity, durability and aesthetics to the satisfaction of the Engineer.
  - Determine cause of defects/damage and establish corrective action plan to prevent similar repetitive defects/damage. Repetitive defects/damage may be grounds for module rejection.
5. Modules may be rejected for any of the following reasons:
  - Fabrication not in conformance with the contract documents.
  - Dimensions not within the allowable tolerances specified in the contract documents.
  - Camber that does not meet the requirements required by the plans and/or shop drawings.
  - Defects indicating concrete proportioning, placement and/or consolidation not in conformance with the contract documents.
  - Damaged ends or edges preventing satisfactory performance of deck joints.
  - Concrete breakage, full-depth concrete cracking, extensive partial depth concrete cracking, or other damage determined to be significant by the Engineer.
  - Other material, quality or condition concerns 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 transport to the site. Establish the differential camber by pre-assembling the modules as required herein.
7. The Fabricator shall document all test results for module structural concrete. The quality control file shall contain at least the following information:
  - Module identification
  - Date and time of concrete placement
  - Concrete cylinder test results
  - Quantity of used concrete and the batch printout

- Form-stripping date and repairs if applicable
- Location/number of blockouts, inserts and lifting devices, as applicable
- Temperature and moisture conditions during curing period

## **B. Fabrication.**

1. Module fabrication shall not begin until Module Fabrication Plan has been reviewed and approved as described herein.
2. Module fabrication procedures shall conform to one of the following:
  - a. Fabrication at preapproved casting plant, in accordance with Section 2507 of the Standard Specifications and Materials I.M. 445.
  - b. Fabrication at alternate site, in accordance with "Alternate Site Casting Notes" in the design plans.
3. The Engineer shall be provided with notice 14 days prior to the anticipated date of shipping of modules to the project site (for plant-cast modules) or casting of module deck (for alternate site-cast modules), to allow coordination of inspection and testing. The Contractor shall follow up with a confirmation notice to the Engineer 2 days prior to the scheduled date for these activities. Deck placement for alternate site-cast modules shall not proceed until Engineer has inspected and approved the deck forming and reinforcing steel placement.
4. Vertical support of the modules during deck placement shall be provided at designated bearing locations only, for the purposes of developing the design dead load deflection.
5. Forms for deck concrete shall not be removed until the applicable concrete strength, age and curing requirements are met, as set forth by the contract documents.
6. All prefabricated superstructure modules shall be pre-assembled to assure proper match between modules to the satisfaction of the Engineer, before transport to the job site. The procedure for leveling any differential camber shall be established during the pre-assembly and shall be approved by the Engineer. Relative bearing seat elevations shall be established after successful module preassembly and shall be compared to the design bearing seat elevations indicated in the plans. Methods for adjustment of substructure bearing seat elevations, if required, shall be submitted to the Engineer for review and approval.
7. The modules shall be evaluated for proper fit, placement, and functionality of compression block assemblies and anchor bolts. Relative anchor bolt locations shall be verified and reviewed against the substructure elements to assure compatibility with substructure reinforcing and/or pile pocket placement.

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

1. **Handling and Storing.**
  - a. Handling and erection bracing shall be the responsibility of the Contractor and shall be in accordance with Chapter 5 of the PCI Design Handbook.
  - b. Modules damaged during handling and/or storage shall be repaired or replaced as described herein and as directed by the Engineer, 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, utilizing proper hoisting procedures. The Contractor is responsible for design of the lifting devices and all necessary precast concrete modifications to accommodate handling stresses in the modules. 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 Iowa DOT and shall not be 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 sufficiently rigid 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 the design compressive strength indicated in the contract documents, whichever comes first. Removal of concrete protection shall not be permitted at any time before the modules attain the specified compressive strength when the surrounding air temperature is below 20°F.
- f. The modules shall not be subject to damaging torsional, dynamic, or impact stresses at any point during handling, storage, transportation, and/or erection.

## **2. Transportation.**

- a. Modules shall not be transported from the casting site until the precast concrete has reached a minimum age of 7 days and the concrete attains the minimum 28 day compressive strength specified in the contract documents, as verified by test cylinders cured in accordance with AASHTO T 23.
- b. Modules may be loaded on a trailer that is capable of supporting the modules during transport without inducing axial, torsional or dynamic stresses to the module. Shock-absorbing cushioning material shall be provided at all bearing points during transportation. Tie-down straps or other means of securing shall be positioned only at designated locations of sufficient bracing and/or blocking.
- c. Transport modules horizontal with steel beams on bottom side for support. Primary vertical support the modules shall be provided at the designated bearing locations, with auxiliary support, bracing and/or blocking provided as required and as noted in the approved Assembly Plan.
- d. Material, quality and condition of the modules will be inspected after transport to the project site. This inspection and any previous inspection(s) will constitute only partial acceptance of the modules.

## **D. General Procedure for Erection of Modules.**

- 1. Modules shall not be placed on substructure components until substructure components have achieved design strength and sufficient bracing has been provided at the substructure components to facilitate the Contractor's intended module placement procedures. Substructure stability during construction shall be the responsibility of the Contractor, and required bracing shall be designed by the Contractor and detailed in the approved Assembly Plan.
- 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. Ensure substructure bearing area is level and true within acceptable construction tolerances, allowing for proper performance of neoprene leveling pads and laminated neoprene bearings in accordance with the Manufacturer's recommendations. Localized smoothing of bearing area may be performed by grinding or other methods approved by the Engineer.
- 4. Lift and erect modules using lifting devices and/or attachment points as shown on the shop drawings in conformance with the Assembly Plan.
- 5. Set module in the proper, designated bearing locations, following match-marks. Do not allow modules to bear at any location on the substructure not designated as a design bearing location. Survey the top elevation of the modules. Check for proper alignment and grade within specified tolerances. Approved neoprene leveling pads shall be used between the bearing and the substructure to compensate for minor differences in elevation between

modules and approach elevations. No more than two leveling pads shall be allowed at any one bearing location, unless otherwise approved by the Engineer.

6. Temporarily support, anchor, and brace all erected modules as necessary for stability and to resist gravity loads, wind loads or other loads until they are permanently secured to the structure, as required and as detailed in the approved Assembly Plan.
7. Differential camber between adjacent modules shipped to the site shall not exceed 1/4 inch. Differential camber may be leveled by applying dead load to the nearest beam on the higher module to bring it within the connection tolerance, or by utilizing a leveling beam 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 shall be threaded ferrules cast in the deck, centered over the beam's web, unless otherwise approved by the Engineer. A minimum tension capacity of 5500 pounds is required for the inserts.
8. All closure pour surfaces shall be wetted to saturated surface dry (SSD) prior to connecting the modules. Joint surface preparation shall be in accordance with the design plans.
9. Concrete holes for lifting devices and/or inserts shall be patched as required by the Engineer and as detailed in the approved Assembly Plan.
10. Do not apply superimposed dead loads or construction live loads to, or perform grinding operations on, the assembled superstructure until the compressive strength test results for the transverse closure pour concrete have reached the design compressive strength of 5.0 KSI, and compressive strength test results for the longitudinal UHPC closure pours have reached a minimum compressive strength of at least 10.0 KSI, or as otherwise recommended by the UHPC manufacturer, whichever is greater.

#### **120243.04 METHOD OF MEASUREMENT.**

The quantity by count of Superstructure Module, of the type specified, will be the plan quantity.

#### **120243.05 BASIS OF PAYMENT.**

##### **A. Superstructure Module, M50 – Exterior.**

Payment will be full compensation for the manufacturing, furnishing, and placement of each Superstructure Module, M50 – Exterior, including rolled steel beams, stiffeners, connection plates, diaphragms, shear studs, lifting devices, leveling devices, hardware, coatings, steel sole plates, steel end plates, flange deflectors, laminated neoprene bearings, neoprene leveling pads, precast concrete deck, deck drains and stainless steel reinforcing.

##### **B. Superstructure Module, M50 – Interior.**

Payment will be full compensation for the manufacturing, furnishing, and placement of each Superstructure Module, M50 – Interior, including rolled steel beams, stiffeners, connection plates, diaphragms, shear studs, lifting devices, leveling devices, hardware, coatings, steel sole plates, steel end plates, laminated neoprene bearings, neoprene leveling pads, precast concrete deck, and stainless steel reinforcing.

##### **C. Superstructure Module, M90 – Exterior.**

Payment will be full compensation for the manufacturing, furnishing, and placement of each Superstructure Module, M90 – Exterior, including rolled steel beams, stiffeners, connection plates, diaphragms, shear studs, lifting devices, leveling devices, hardware, coatings, steel sole

plates, steel end plates, flange deflectors, laminated neoprene bearings, neoprene leveling pads, precast concrete deck, deck drains and stainless steel reinforcing.

**D. Superstructure Module, M90 – Interior.**

Payment will be full compensation for the manufacturing, furnishing, and placement of each Superstructure Module, M90 – Interior, including rolled steel beams, stiffeners, connection plates, diaphragms, shear studs, lifting devices, leveling devices, hardware, coatings, steel sole plates, steel end plates, laminated neoprene bearings, neoprene leveling pads, precast concrete deck, and stainless steel reinforcing.