



STATE OF MAINE  
DEPARTMENT OF TRANSPORTATION  
16 STATE HOUSE STATION  
AUGUSTA, MAINE  
04333-0016

JOHN ELIAS BALDACCI  
GOVERNOR

DAVID A. COLE  
COMMISSIONER

September 30, 2010  
Subject: **Caribou**  
Federal Project No: HPP-STP-6462(300)  
State Pin No: 006462.30  
**Amendment No. 2**

Dear Sir/Ms:

Make the following change to the Bid Document:

In the Bid Book (pages 85 thru 89), **REMOVE** "SPECIAL PROVISIONS, SECTION 509, COMPOSITE ARCH SUPERSTRUCTURE", 5 pages dated August 18, 2010 and **REPLACE** with the attached new "SPECIAL PROVISIONS, SECTION 509, COMPOSITE ARCH SUPERSTRUCTURE", 6 pages dated September 29, 2010.

Consider this change and information prior to submitting your bid on October 6, 2010.

Sincerely,

A handwritten signature in black ink, appearing to read "Scott Bickford".

Scott Bickford  
Contracts & Specifications Engineer



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SPECIAL PROVISIONS  
SECTION 509  
COMPOSITE ARCH SUPERSTRUCTURE

1. DESCRIPTION

This work shall consist of installing composite arches of the Bridge-in-a-Backpack™ system for bridge construction in accordance with these specifications and in conformity with the lines, grades, and dimensions shown on the Contract Drawings or established by the Resident.

Composite arches will be designed by Advanced Infrastructure Technologies (AIT), supplied by Maine DOT, and delivered to the site by AIT. The contractor shall provide AIT with a projected arch delivery date no later than 30 days after the date of award, or 60 days prior to date of delivery, whichever comes first. Lead time for arch fabrication will be approximately 60 days. The contractor shall notify AIT a minimum of 10 days in advance of the date of delivery. Delivery must take place within 60 days of the delivery date agreed upon. Failure to meet these requirements will result in additional expenses to the contractor for storing the composite arches off-site.

The arches shall consist of carbon fiber tubes reinforced with vinyl ester resin. The weight of each hollow composite arch shall be noted on the manufacturer's shop drawings. The quantity and geometry of the composite arches will conform to the plans and drawings, and will include any vent holes, fill holes, or locator holes prior to delivery.

The contractor is responsible for the complete installation of the composite arches that consist of unloading arches, erecting arches into the abutment, providing and installing the arch filling apparatus, casting arches into the abutment, attaching FRP sheathing to the arches, filling arches with concrete, inspecting the filled arches for voids, and completing any post-filling of voids.

Related Special Provisions for this specification include:

- 1.1 Item 509.2 – EXPANSIVE SCC CONCRETE
- 1.2 Item 509.3 – FRP SHEATHING (DECK PANELS)

2. DESIGN

The composite arch bridge structure will be designed and stamped by a licensed Professional Engineer of the state having jurisdiction. Sealed calculations and Contract Drawings will be provided for elements of the bridge system contained in the scope of these specifications.

The arch design loads are in accordance with the AASHTO LRFD Bridge Design Specifications 5<sup>th</sup> Edition for HL-93 loading, with the Maine Modified Truck incorporated in the design.

3. SUBMITTAL - INSTALLATION PLAN

A written installation plan shall be submitted to the Resident at least 30 days prior to arch installation. The written installation plan shall provide as a minimum the following information:

- 1.1 Construction plan, sequence and schedule.
- 1.2 Temporary storage conditions for arches, if applicable.
- 1.3 Any temporary bracing plans.
- 1.4 List all equipment to be used. Manufacturer performance data will be required for all pumping equipment.
- 1.5 The intended method and sequence of placing the concrete. This shall include a written narrative and diagrams and/or photographs as necessary so that the process will be clearly defined.
- 1.6 The name(s) of the responsible person in charge for the Contractor.
- 1.7 A description of the inspection procedure for checking the arches after the concrete filling to ensure each arch has been completely filled, and free of voids. The description should outline the method of inspection and materials and methods to be used to fill any remaining voids.

The written installation plan shall be reviewed for record only, the contractor shall be fully responsible for arch concrete filling and erection.

4. MATERIALS-COMPOSITE

The engineered composite material for the hollow arch tubes shall be designed by AIT to meet the specific requirements of the bridge.

Shop drawings shall be provided by AIT detailing the arch dimensions and tolerances, fill hole and vent hole sizes and locations, and arch weight.

5. MATERIALS-CONCRETE

Self-Consolidating Concrete used for filling arches shall conform to specification 509.2 – EXPANSIVE SCC CONCRETE.

The contractor shall submit the final mix design for approval prior to concrete placement.

6. EQUIPMENT

Concrete Pump - For placement of the SCC, a boom type concrete pump truck will be the only method allowed. The pump truck shall be capable of reaching all arch tubes to be filled with one truck load of concrete, without moving from its initial location. In the event of a pump truck failure, the contractor shall have a backup method in place for placing SCC in any remaining unfilled portion of an arch tube. The backup method for placing the SCC shall be approved by the Resident, and in place and capable of completing the arch filling within ten minutes of the pump truck failure.

7. HANDLING AND STORAGE

Arch Handling - Care shall be taken when handling the hollow composite arches such that no damage is caused. When moved or placed by hand, arches shall be stabilized to prevent tipping over. When moved by hoist, at least two pick points shall be used which are at least six feet apart. Each strap shall provide at least 2 inches of padded contact area.

Arch Storage - Hollow composite arches shall be stored to prevent damage.

8. INSTALLATION

The arches shall be installed in a vertical position prior to casting with a maximum allowable variation of  $\pm 1/2$ " in-plane and out-of-plane.

FRP sheathing shall be installed in accordance with Specification 509.3 – FRP SHEATHING (DECK PANELS). All sheathing shall be installed prior to embedding the arches into the abutments or filling the arches with SCC. Sheathing shall have no concrete infill in place during arch filling procedure.

Hollow composite arches shall be embedded within the abutment as specified in the contract drawings. It is permissible to vibrate the concrete in the abutment around the arch such that the concrete inside the tube levels with the abutment concrete, but care must be taken to maintain the arch location within the abutment and not to damage the arch.

Abutments shall reach a minimum compressive strength of 2,000 psi prior to filling of arches with SCC concrete.

All arches shall be filled under the supervision of the Resident.

Each arch shall be filled with SCC in a continuous placement operation. Vibration shall not be allowed when filling the arches.

Arch tube SCC concrete must reach a minimum compressive strength of 2000 psi prior to proceeding with further work such as deck infilling or Headwall Installation.

Prior to arch SCC reaching a minimum compressive strength of 2000 psi, no loading other than one workman per arch will be allowed on the FRP deck.

## 9. BACKFILLING REQUIREMENTS

No backfill shall be placed against any structural element until it has been approved by the Resident.

Backfill material shall conform to the Standard Specifications Section 203.12 - Construction of Earth Embankment with Moisture and Density Control, except that the minimum required compaction shall be 95 percent of maximum density as determined by AASHTO T99, Method C or D.

Backfill shall extend to the grades shown on the plans, and shall be performed according to Section 203 in the Standard Specifications, with the additional requirements of this specification.

- 1.1 Backfilling is not allowed until arch tube SCC concrete has reached a minimum compressive strength of 2000 psi.
- 1.2 To prevent introducing unbalanced stresses in the arches, at no time shall the difference between the heights of backfill on opposite sides of the arches exceed 2 feet.
- 1.3 When applicable, backfill against a waterproofed surface or filter material shall be placed carefully to avoid damage to the material.
- 1.4 Mechanical tampers or approved compacting equipment shall be used to compact all backfill and embankment immediately adjacent to each side of the structure and over the top of the arches until it is covered to a minimum depth of one foot. The backfill within four feet of each side of the structure shall be placed in lifts of 6 inches or less (loose depth). Heavy compaction equipment shall not be operated in this area or over the arches until it is covered to a depth of two feet.
- 1.5 Lightweight dozers and graders may be operated over arches having one foot of compacted cover, but heavy earth moving equipment (larger than a D-4 Dozer, weighing in excess of 12 tons, or having track pressures of eight psi or greater) shall require two feet of cover. In no case shall equipment operating in excess of the design load (HL93) be permitted over the bridge unless approved by the Resident.
- 1.6 Any additional fill and subsequent excavation required to provide this minimum cover shall be made at no additional cost to the project.

10. TESTING AND INSPECTION

Testing of the arch tube SCC concrete shall be in accordance with Specification 509.012 – EXPANSIVE SCC CONCRETE.

The following construction activities shall be subject to oversight or inspection by the Resident in accordance with the written installation plan. The Contractor shall notify the AIT Engineer of the schedule for each of these activities at least 3 days prior to the operation.

- 1.1 Initial placement of the arches in the abutment.
- 1.2 Embedment of the arches in the abutment.
- 1.3 Filling of the arches with SCC concrete.
- 1.4 Inspection of the arches for voids to ensure they have been completely filled. This should occur prior to any concrete FRP sheathing slab placement

11. REJECTION

Arches shall be subject to rejection on any failure to account for any of the specification requirements. Individual arches may be rejected because of any damage to the hollow composite arches which is 'severe' in the assessment of the Resident such that the damage compromises the ability of the member to meet the design strength.

Any rejected arches shall be replaced with an undamaged member at the Contractor's expense.

12. REPAIRS

The only repairs permitted are those used to fill remaining voids after complete arch filling.

The only allowable repair methods for filling remaining voids are those specified in the approved "Written Installation Plan".

13. BASIS OF PAYMENT

The accepted quantity of Composite Arch Superstructure will be paid for at the unit price per Lump Sum complete in place, which price shall be full compensation for installing/erecting the composite arches and sheathing, including arch tube concrete, all necessary hardware, and the furnishing of all labor, materials, tools, equipment & incidentals necessary to complete the work. Placement of the overlay concrete slab is not included in this item.

Payment will be made under:

| <u>Pay Item</u>   | <u>Pay Unit</u> |
|---|-----------------|
| 509.74 Composite Arch Superstructure Erection—Installation Only | Lump Sum        |