A d d e n d u m

Iowa Department of Transportation
Office of Contracts

Date of Letting: April 18, 2006
Date of Addendum: March 24, 2006

B.O.	Proposal ID	Proposal Work Type	County	Project Number	Addendum
001	08-C008-039	Bridge and Approaches – PPCB	Boone	IBRC-C008(39)--8E-08	18apr001.a01

Notice: Only the bid proposal holders receive this addendum and responsibility for notifying any potential subcontractors or suppliers remains with the proposal holder.

Make the following changes to the Proposal Attachments:

Replace:

SP-011161 May 16, 2006
SPECIAL PROVISIONS FOR TRAFFIC SIGNALIZATION

With the attached:

SP-011162 April 18, 2006
SPECIAL PROVISIONS FOR PRECAST POST-TENSIONED SLAB PANELS
*** INTENDED FOR: BOONE COUNTY IBRC-C008(39)--8E-08 ***

Iowa Department of Transportation

SPECIAL PROVISION
FOR

PRECAST POST-TENSIONED SLAB PANELS

Boone County
IBRC-C008(39)—8E-08

Effective Date
April 18, 2006

THE STANDARD SPECIFICATIONS, SERIES 2001 ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE SPECIAL PROVISIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

011162.01 PRECAST POST-TENSIONED SLAB PANEL CONSTRUCTION

A. DESCRIPTION

Precast post-tensioned slab panel construction shall consist of fabrication, off site storage, transporting and erecting the precast slab panels that are post-tensioned together. All slab panels shall be placed and post-tensioned together in accordance with the contract documents.

Upon completion of the slab panel erection and grinding, the final surface geometry shall be in accordance with the established line and grades shown in the plans.

The Contractor shall submit written Quality Control and Production Plans to the Engineer at least 14 calendar days prior to any panel production. The Quality Control and Production Plan must be accepted by the Engineer prior to any fabrication. The Quality Control Plan shall be in accordance with Materials I.M. 570. In addition, the Quality Control Plan shall detail the correspondence and submittal process. The Production Plan shall detail the proposed fabrication method and the procedures that will be used to accomplish production using this fabrication method.

B. SHOP DRAWINGS AND CALCULATIONS

Information Required: The Contractor shall submit detailed shop drawings, calculations and manuals which include, but are not necessarily limited to, the following:

1. A schedule of the timing and sequence of slab panel casting and erection.

2. Details of the forms for the manufacture of the slab panels.

3. Calculations and details for lifting, storage, or stacking of the slab panels. (Note: any additional strengthening of the slab panels to accommodate stacking shall be at no additional expense to the Contracting Authority).

4. Details of inserts or lifting holes including any necessary localized strengthening and the materials and methods to fill and finish such holes.

5. Details and calculations for any localized strengthening for concentrated supports, loads, or reactions from any special erection equipment placed in locations not already allowed for in the plans.

6. Details and complete description of post-tensioning hardware components and any other embedments to be cast into the slab panels.

7. Details of all embedded items and all protruding items.

8. Fully and accurately dimensioned views showing the geometry of the slab panels including projections, recesses, notches, opening, and blockouts.

9. Appropriate details of changes from dimensions shown on the plans where variations are made to slab panels, including any special reinforcing required but not shown on the plans, with clear and concise cross-reference to the appropriate plans to which the variations apply.

10. Size and type of debonding shields for all post-tensioning tendons with other relevant details.

11. Details of and supporting calculations for any modifications to reinforcement at anchorages, made necessary for accommodating the elected post-tensioning system hardware.

12. A procedure for the casting and geometry control of the slab panels in accordance with the information provided in the contract documents.

13. The volume of concrete, the weight of reinforcement, and weight of pre-tensioning in each precast slab panel and the totals of these for the superstructure summarized and tabulated on the shop drawings.

14. The post-tensioning calculations.

C. CASTING REQUIREMENTS

1. General: Casting of slab panels shall not begin until the Engineer approves the relevant shop drawings, calculations, casting manuals, concrete forms, concreting operations and the post-tensioning system components and layout.

2. Forms: The Contractor shall be responsible for the design and engineering of the forms as well as their construction. All exposed formed surfaces of each element of the structure shall be formed with the same material to produce similar concrete surface textures, color, and appearance. Obtain the Engineer’s approval of forms prior to initiating casting operations. Build the details shown on the Plans or as amended by approved shop drawings into the forms.

The Engineer will review forms for suitability. Any forms determined unsuitable shall be repaired or replaced.

Where sections of forms are joined, ensure that offsets in flat surfaces do not exceed 1/8 inch and that offsets with corners and bends do not exceed 1/4 inch.

All joints in the forms and contact points with bulkheads and existing panels shall have have good fitting seals to prevent loss of fine material and cement grout.

The Contractor shall check and inspect forms on a regular weekly basis to ensure proper alignment and geometric accuracy. Forms which fail to meet the specified casting tolerances shall not be used until such corrections are made to produce slab panels within the specified tolerances.

D. EMBEDDED ITEMS

1. General: Embedded items shall be in accordance with specifications for prestressed and post-tensioned construction and the requirements herein.

2. Embedded Post-Tensioning Debonding Shields: Accurately align debonding shields and position them at the locations shown on the plans or according to the approved shop drawings or as otherwise approved by the Engineer. Securely fasten all internal shields in position at regular intervals not exceeding 1 foot. to prevent movement, displacement or damage from concrete placement and consolidation operations. Any auxiliary ties and support bars needed for these purposes shall be considered incidental and at no extra cost to the project. Prevent the concrete cover requirements from being violated by any auxiliary ties and support bars.

Show the method and spacing of debonding shield supports on appropriate shop drawings.

Ensure that all alignments are smooth and continuous with no lips, kinks or dents.

Carefully check and repair all shields as necessary before placing concrete.

After installing the forms, ensure that all ends of shields are sealed water-tight to prevent the entry of water and debris.

3. Reinforcing Steel: Fabricate and place reinforcing steel in accordance with the Plans or as superseded by the approved shop drawings and as required herein.

E. CONCRETE PLACEMENT, CONSOLIDATION, AND FINISHING

1. General: Do not deposit concrete into the forms until the entire set-up of the forms, reinforcement, shields, anchorages and embedded items have been thoroughly inspected and checked.

Do not place concrete until the Engineer is satisfied that all the above items have been properly inspected and checked, and the rate of producing and placing the concrete will be sufficient to complete the casting and finishing operations while the concrete is workable, that experienced concrete finishers are available where required for finish work and that all necessary finishing tools and equipment are on hand at the site of the work and are in satisfactory condition for use.

During conveying and placement, protect concrete against undue drying or rise in temperature and inclement weather.

2. Concrete Placement Equipment: Use concrete placement equipment of a size and design which permits placing concrete while the concrete is workable. Clean all equipment at the end of each operation or workday and, prior to reuse, check the equipment and clean off hardened concrete and foreign materials.

3. Concrete Placement and Consolidation: Discharge individual loads of concrete into the forms, and place and consolidate in the required locations.

Place and consolidate concrete with care so that post-tensioning shields, anchorages, and any other embedded items are maintained in their proper positions and are not damaged.

Use external vibrators for consolidating concrete when the concrete is inaccessible for adequate consolidation by internal means. When external vibration is used, construct the forms sufficiently rigid to resist displacement or damage.

Vibrate concrete in a manner which avoids displacement or damage to reinforcement, post-tensioning shields, anchorages and other embedded items.

No construction joints are allowed within a slab panel, except as may be detailed on the plans.

F. CURING

1. General: Steam curing in accordance with Article 2407.10 of the Standard Specifications is required.

2. Removal of Forms: Prior to removing the forms, protect the plastic concrete from adverse weather effects.

Keep supporting forms in place until the concrete has reached the required strength for form removal according to the contract documents.

Test cylinders shall be made and cured in the same manner as the slab panel, to confirm the form release strength prior to removing forms.

Avoid cracking or damaging the slab panel when removing the forms, especially shear keys. Notify the Engineer of any damage which occurs and repair with a method approved by the Engineer.

3. Test Samples: Provide additional test samples and testing for compressive strength on precast slab panels to control the construction activities and to ensure adequate strength of these components at various stages of their manufacture and assembly.

Make test cylinders in accordance with Materials I.M. 315, cured in the same manner as the structural components to ensure adequate compressive strength has been achieved in accordance with the plan requirements for the following conditions:

a. Prior to form release and/or moving the components to storage.

b. Prior to placing a component into position in the structure and/or stressing of longitudinal post-tensioning tendons if the component is less than 28 calendar days old.

Compression testing and strength requirements shall meet Materials I.M. 570.

All cost for concrete testing shall be included in the price bid for the various precast structural components.

4. Age at Erection: precast components shall be at least 28 calendar days old prior to incorporating into the structure.

G. TOLERANCES

1. **General:** In addition to Article 2407.12 of the Standard Specifications, the following tolerances shall apply to the fabrication of precast components and shall prevail when in conflict with Article 2407.12.

All Fabricated Slab Panels: Flat Surface (deviation from a plane at any location)
±1/8 inch per foot not to exceed a total of 1/4 inch

2. **Corrections:** Control dimensions from panel to panel and compensate for any deviations within a single panel or series of panels so that the overall dimensions of the completed structure meet

the dimensions and overall erection tolerances shown on the plans and allowed by this special provision.

3. **Repairs:** Repair minor breakage, spalling, or honeycomb not over 1 inch deep by a method approved by the Engineer. Major breakage, spalling, or honeycomb in excess of 1 inch deep is subject to the Engineer's structural review. If found to be satisfactory, repair these areas using a method approved by the Engineer.

H. PRECAST SLAB PANEL HANDLING, STORAGE AND SHIPMENT

Handle slab panels with care to prevent damage. Handle slab panels using only the devices shown on the shop drawings for this purpose. Store all precast slab panels level in the flat position. Firmly support all precast slab panels for storage and shipment as per approved shop drawings. Do not stack slab panels one upon another unless approved by the Engineer.

Prior to shipment the Engineer will review each segment for compliance. Thoroughly clean the faces of all joints of laitance, bond breaking compound and any other foreign material by light sand blasting prior to shipment.

Fully secure the slab panels against shifting during transport. Provide a storage area of suitable stability for the slab panels to prevent differential settlement of the slab panel supports during the entire period of storage.

The cost of this work will be included in the pay item for Precast Post-tensioned Slab Panels.

011162.02 HIGH PERFORMANCE CONCRETE FOR PRECAST POST-TENSIONED SLAB PANELS

A. DESCRIPTION

This work shall be done according to Section 2407 of the Standard Specifications and as modified in this special provision.

This work shall consist of providing high performance concrete for precast post-tensioned slab panels. High performance concrete consists of producing a concrete mix with low permeability and high strength.

B. MATERIALS

Coarse aggregate shall be crushed limestone meeting Class 3 durability or better.

Trial Batch Concrete: The Contractor may submit up to two trial batches of concrete per project at no cost. The Contractor will be charged $500 for each additional trial batch submittal or resubmittal. The District Materials Engineer may waive trial batch testing for a mix, provided the mix was previously tested and resulted in satisfactory mix properties. Adjustments to a previously approved mix, not requiring a new trial batch, will be at the discretion of the District Materials Engineer. The trial batch concrete shall be of a size typically used in day-to-day operations and shall be made at least 60 calendar days prior to placement.

The trial batch concrete shall be representative of the production concrete.

The District Materials Engineer shall be notified at least 7 calendar days prior to batching. The Engineer will cast all samples from the trial batch concrete.

Trial batch concrete shall be tested for permeability by the Engineer. Two permeability samples shall be cast in 4 inch by 8 inch plastic cylinder molds and capped. Within 7 calendar days of casting the samples shall be delivered to the Central Materials Testing Laboratory. The samples shall remain in their plastic molds with their lids until delivered. The samples shall be stripped of their molds and wet cured to an age of 7 calendar days in the moist room. After 7 calendar days, the samples shall be

submerged in water heated to 100°F until an age of 28 calendar days or more. Two test specimens shall be obtained from each cylinder. Permeability shall be tested in accordance with AASHTO T 277 at 28 calendar days or more. A coulomb reading of 2500 or less, based on the average of four test results, will be considered acceptable.

Trial batch materials, proportions, and test results shall be reported to the District Materials Engineer for approval.

C. BASIS OF PAYMENT
No separate payment will be made for the required use of High Performance Concrete.

The cost of designing, testing, and producing high performance concrete shall be incidental to the price bid for Precast Post-tensioned Slab Panels.

011162.03 POST-TENSIONING OPERATIONS

A. General: The post-tensioning operation shall be performed by qualified personnel with experience in similar work and as shown on the contract documents.

B. Stressing Strands: Tension all strands with hydraulic jacks so that the post-tensioning force is not less than that required by the contract documents.

C. Maximum Stress at Jacking: The maximum temporary stress (jacking stress) in the post-tensioning strands shall not exceed 80% of its specified minimum ultimate tensile strength.

Do not overstress tendons to achieve the expected elongation.

D. Initial and Permanent Stresses: The post-tensioning strands shall be anchored at initial stresses that will result in the long term retention of permanent stresses or forces of no less than those shown on the contract documents. The initial stress after anchor set shall not exceed 70% of the specified ultimate tensile strength of the post-tensioning strands.

Permanent stress and permanent force are the stress and force remaining in the post-tensioning strands after all losses, including long term creep and shrinkage of concrete, elastic shortening of concrete, relaxation of steel, losses in the post-tensioning strands from the sequence of stressing, friction and unintentional wobble of the strands, anchor set, friction in the anchorages and all other losses peculiar to the post-tensioning system.

E. Stressing Equipment: Only use equipment furnished by the manufacturer of the post-tensioning system (strands, hardware, anchorages, etc.).

F. Stressing Jacks and Gauges: Each jack shall be equipped with a pressure gauge for determining the jacking pressure. The pressure gauge shall have an accurately reading dial at least 6 inch in diameter.

G. Calibration of Jacks and Gauges: Each jack and its gauge shall be calibrated as a unit with the cylinder extension in the approximate position it will be in at the final jacking force. Calibration shall be done when the jack is connected to the equipment (pumps and gauges) in the identical configuration as will be used on the job site, e.g. with the same length hydraulic lines. Initial calibration of the jacks and gauges shall be performed by an independent laboratory using a proven load cell. For each jack and gauge unit used on the project, furnish certified calibration charts from the independent laboratory prior to stressing the first tendon.

Certified calibration shall be made at the start of the work, or as requested by the Engineer. Calibrations subsequent to the initial calibration with a load cell may be accomplished by the use of a master gauge. Supply the master gauge to the Engineer in a protective waterproof container capable

of protecting the calibration of the master gauge during shipment to a laboratory. Provide a quick-attach coupler next to the permanent gauge in the hydraulic lines to enable quick and easy installation of the master gauge to verify the permanent gauge readings. The master gauge will be calibrated by and remain in the possession of the Engineer for the duration of the project.

Any jack repair, such as replacing seals or changing the length of the hydraulic lines, is cause for recalibration using a load cell.

No extra compensation will be allowed for the initial or subsequent calibrations or for the use and required calibrations of the master gauge.

H. Elongations and Agreement with Forces: Ensure that the forces being applied to the tendon and the elongation of the post-tensioning tendon can be measured at all times.

Elongations shall be measured to the nearest 1/16 inch.

For the required strand force, the observed elongation shall agree within 5% of the theoretical elongation or the entire operation shall be checked and the source of error determined and remedied to the satisfaction of the Engineer before proceeding further. Do not overstress the tendon to achieve the theoretical elongation.

I. Friction: The plans were prepared based on assumed friction and anchor set. Submit calculations and show a typical strand force diagram, after friction and anchor set losses, on the shop drawings based upon the expected actual coefficients and values for the post-tensioning system to be used. Show these coefficients and values on the shop drawings.

If, in the opinion of the Engineer, the actual friction significantly varies from the expected friction, revise post-tensioning operations so the final tendon force is in agreement with the plans.

J. Cutting of Post-Tensioning Strands: Cut post-tensioning strands by an abrasive saw within 1 inch to 1 3/4 inch away from the plan location. Flame cutting of post-tensioning strands shall not be used.