June 2, 2010

SPECIAL PROVISION

PROJECT # F-I84-6(97)108
PIN # 6560

SECTION 03132S

PRECAST APPROACH SLABS

Add Section 03132:

PART 1 GENERAL

1.1 SECTION INCLUDES

A. This work consists of furnishing, erecting, and installing precast concrete approach slab elements for bridges including all necessary materials and equipment to complete the work as shown on the plans. The use of cast-in-place concrete will not be considered for substitution.

B. Procedures for installing elements.

C. Procedures for placing structural non-shrink grout.

D. Procedures for placing high early strength concrete at closure pours.

1.2 RELATED SECTIONS

A. Section 02982: Bridge Concrete Grinding

B. Section 03055: Portland Cement Concrete

C. Section 03211: Reinforcing Steel and Welded Wire

D. Section 03310: Structural Concrete

E. Section 03372: Thin Bonded Polymer Overlay

F. Section 03575: Flowable Fill

1.3 REFERENCES

A. AASHTO T 106: Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. Cube Specimens)

B. AASHTO T 160: Standard Method of Test for Length Change of Hardened Hydraulic Cement Mortar and Concrete

C. AASHTO T 161: Standard Method of Test for Resistance of Concrete to Rapid Freezing and Thawing

D. AASHTO T 260: Standard Method of Test for Sampling and Testing Chloride Ion in Concrete and Concrete Raw Materials

E. ASTM A 970: Standard Specification for Headed Steel Bars for Concrete Reinforcement

F. ASTM C 578: Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation

G. ASTM C 666: Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing

H. ASTM C 882: Standard Test Method for Bond Strength of Epoxy-Resin Systems Used With Concrete By Slant Shear

I. ASTM D 4635: Standard Specification for Polyethylene Films Made from Low-Density Polyethylene for General Use and Packaging Applications

J. PCI Design Handbook, Fifth Edition with all Interims and Erreta

K. UDOT Quality Management Plan

1.4 DEFINITIONS

A. Approach Slab: A structural slab that is designed to span from the rear face of the abutment to the sleeper slab. The purpose of approach slabs is to span over any potential settlement of the abutment backfill. The soil under the slab is not intended to support the slab. Support is provided by the abutment and the sleeper slab.

B. Sleeper Slab: A structural slab that is designed as a transition from the approach slab to the approach roadway pavement. The sleeper slab bears directly on the subgrade and supports the end of the approach slab. The joint between the sleeper slab and the approach slab is used to accommodate the thermal movement of the bridge. This is accomplished by means of a structural expansion joint.

1.5 SUBMITTALS

A. The following submittals require written approval from the Engineer:
   1. Shop Drawings:
      a. Submit five sets of half-size, 11 x 17 inch sheets with a 1½ inch blank margin on the left-hand edge.
      b. Place the project designation data in the lower right-hand corner of each sheet.
      c. Shop drawings prepared and stamped by Professional Engineer licensed in Utah.
      d. Show all lifting inserts, hardware, or devices and location on the shop drawings for Engineer's approval.
      e. Show locations and details of the lifting devices, including supporting calculations, type, and amount of any additional reinforcing required for lifting. Design all lifting devices based on the no cracking criteria in Chapter 5 of the PCI Design Handbook.
      f. Show minimum compressive strength attained prior to handling the precast elements.
      g. Show details of vertical adjusting hardware.
      h. Begin fabrication only after approval has been granted.
      i. The Department will reject any elements fabricated before receiving written approval, or any elements that deviate from the approved drawings. The Contractor is responsible for costs incurred due to faulty detailing or fabrication.
      j. The Engineer reserves the right to retain these drawings up to 14 calendar days without granting an increase in the number of working days on the project. This duration is reduced to 7 days when the drawings are submitted electronically. This right applies each time the drawings are submitted or re-submitted.
   2. Structural Non-Shrink Grout
      a. Submit a Certificate of Compliance to Engineer.
      b. Submit a proposed method for forming grout voids and installing the structural non-shrink grout, sequence, and equipment for grouting operation to Engineer for review for a minimum of 14 days. Obtain approval prior to placing structural non-shrink grout begins.

B. Concrete Requirements
   1. Submit substitutions for self-consolidating concrete mix designs to Engineer for approval as an alternate to the structural concrete for the precast elements.

2. Submit to the Engineer for approval a high early strength concrete mix or material data information that states the percentage of each component to be used depending on the closure pour concrete selected.
3. Regardless of the type of high early strength concrete proposed, submit substantive data that demonstrates the ability of the material to meet the specification requirements with the proposed mix design at least two weeks prior to its use.

C. Defects and breakage of precast elements
1. Submit proposed written repair procedures for approval.

PART 2 PRODUCTS

2.1 MATERIALS

A. Concrete
1. Precast elements: Use Class AA (AE) concrete as specified in Section 03055 and on the plans.
2. Bedding under sleeper slabs: Use flowable fill conforming to the requirements of Section 03575.
3. High Early Strength Concrete: Use one of the following:
   a. A high early strength concrete mix designed as follows.
      1) Use air-entraining, Portland cement, fine and coarse aggregates, admixtures, water, and additives
      2) Use between 4 and 7 percent-entrained air.
      3) Develop a mix that can attain a 6-hour compressive strength of 2,500 psi, and a 7-day compressive strength of 4,000 psi.
      4) Additionally, develop a mix that contains shrinkage compensating additives such that there will be no separation of the closure pour concrete from the adjacent precast concrete.
      5) Use a shrinkage-compensating additive that produces expansion in the high early strength concrete of no more than 3 percent.
   b. A proprietary concrete mix may be used that meets the same physical requirements as those stated above.

B. Reinforcing Steel
1. Use reinforcing conforming to the requirements of Section 03211. Use coated reinforcing steel in all elements.
2. Use headed reinforcing bars that meet the requirements of ASTM A 970, if shown on the plans.

C. Non- Shrink Grout:

1. Use structural non-shrink grout for bedding under the approach slab at the sleeper slab support as shown on the plans.
   a. Mix structural non-shrink grout just prior to use according to the manufacturer's instructions.
   b. Use gray, non-shrink grout concrete containing no calcium chloride or admixture containing calcium chloride or other ingredient in sufficient quantity to cause corrosion to steel reinforcement.
   c. Follow manufacturer's recommendation for dosage of corrosion inhibitor admixture.
   d. Use quick-setting, rapid strength gain, non-shrink, and high-bond strength grout.
   e. Use a grout that is flowable.
   f. Warranty the in-place structural non-shrink grout performance and workmanship for two years.
   g. Repair or refund at the Department's option any bonding failures that occur during the warranty period.
   h. Use structural non-shrink grout that meets a minimum compressive strength of 4,000 psi within 24 hours when tested as specified in AASHTO T 106.
   i. Meet all the requirements of AASHTO T 160 with the exception that the Contractor-supplied cube molds will remain intact with a top firmly attached throughout the curing period.
   j. Use structural non-shrink grout with no expansion after seven days.
   k. Refer to Table 1 for structural non-shrink grout requirements.

Table 1

Structural Non-Shrink Grout			
***Properties**	**Requirements**	**ASTM**	**AASHTO**
Accelerated Weathering	As Specified in ASTM or AASHTO	C 666	T 260
Compressive Strength	>5,000 psi @ 28 days		T 106
Accepted Bond Strengths	>1,000 psi @ 24 Hours	C 882	
Test Medium	<3% White Utah Road Salt		T 161
Accepted Weight Loss	<15% @ 300 Cycles		T 161
Length Change	No expansion after 7 days		T 160

*Certified test results from a private AASHTO accredited testing laboratory will suffice for acceptance.

D. Precast Concrete Elements
   1. Use a Department Certified Concrete Precaster or a pre-qualified project site caster for concrete products according to the Department Quality Management Plan: Precast-Prestressed Concrete Structures.

E. Bond Breaker Material
   1. Provide low density polyethylene sheet meeting the requirements of ASTM D 4635 that will allow for sliding of the structural concrete after placement. Supply sheets that are ⅛ inch thick. Two layers are required at each interface.

F. Steel Bearing Plate
   1. Provide a steel bearing plate as shown on the plans.

G. Polystyrene Forming Material
   1. Provide expanded polystyrene sheet conforming to ASTM C 578.

2.2 QUALITY ASSURANCE

A. Precast Substructure Elements
   1. Department pre-qualifies pre-cast and site-cast manufacturers according to the UDOT Quality Management Plan: Pre-cast/Prestressed Concrete Structures.
   2. Permanently mark each precast element with date of casting and supplier identification. Stamp markings in fresh concrete.
   3. Prevent cracking or damage or precast elements during handling and storage.
   4. Replace defects and broken precast elements
      a. Members that sustain damage or surface defects during fabrication, handling, storage, hauling, or erection are subject to review or rejection.
      b. Obtain approval before performing repairs.
      c. Repair work must reestablish the elements' structural integrity, durability, and aesthetics to the satisfaction of the Engineer.
      d. Determine the cause when damage occurs and take corrective action.
      e. Failure to take corrective action leading to similar repetitive damage can be cause for rejection of the damaged element.
      f. 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.
      g. Full depth cracking and breakage greater than one foot are cause for rejection.

5. Construct precast elements to tolerances shown on the plans.
6. The plant will document all test results. The quality control file will contain at least the following information:
    a. Element identification
    b. Date and time of cast
    c. Concrete cylinder test results
    d. Quantity of the used concrete and the batch printout
    e. Form-stripping date and repairs if applicable
    f. Location or number of blockouts and lifting inserts
    g. Temperature and moisture of curing period
7. Document lifting device details, requirements, and inserts.

PART 3 EXECUTION

3.1 FABRICAT ION

A. Do not place concrete in the forms until the Engineer has inspected and approved all the materials in the elements.

B. 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 precast elements to the job site.

C. Do not place concrete in the forms until the Engineer has inspected the form and has approved the placement of all materials in the precast elements.

D. Finish the precast elements according to Section 03310. Trowel finish the top surface of all precast concrete elements.

E. Maintain a minimum compressive strength of 500 psi prior to stripping the form.

F. Wet cure elements for 14 consecutive days. This cure is to begin immediately after performing the final finish.
    1. Wet cure by covering all exposed surfaces with wet burlap, cotton mats, or both, and plastic sheets.
    2. Maintain a saturated condition for the burlap and cotton for the entire duration of the 14 days ±7 days.
    3. A 10 percent pay incentive exists for wet cure durations of 21 consecutive days. A 10 percent pay disincentive exists for durations provided at the minimum required 7 days.

G. Supply test data such as slump, air voids, or unit weight for the fresh concrete and compressive strengths for the hardened concrete after 7, 14, and 28 days, if applicable.

3.2 INSTALLATION OF SLEEPER SLABS AND APPROACH SLABS

A. Establish working points, working lines, and benchmark elevations prior to placement of all elements.

B. Check the condition of the receiving bonding surface prior to connecting elements and take any necessary measures to remove items such as dust, rust, and debris to provide the satisfactory bonding required.

C. Place elements as shown on the plans. Adjust the height of each element by means of leveling devices or shims.

D. Lift sleeper slab segments using lifting devices as shown on the shop drawings.

E. Set sleeper slab in the proper horizontal location. Check for proper alignment and grade within specified tolerances.

F. Adjust sleeper slabs prior to full release from the crane to facilitate the vertical adjustment process. This will reduce the amount of torque required to turn the bolts in the leveling devices. Check for proper grade within specified tolerances.

G. Pour or pump flowable bedding concrete through the ports. Start from the center of the sleeper slab and proceed toward the outside edges. Verify that bedding concrete is filling the entire void between the sleeper slab and the subgrade.

H. Do not remove the installation bolts or proceed with the installation of the approach slab until the compressive test result of the cylinders for bedding concrete has reached the specified minimum values.

I. Install bond breaker materials in two layers as shown on the plans. Seal the edges and joints to prevent concrete or mortar from penetrating the interface between the two sheets. Duct tape is acceptable for this purpose.

J. Lift approach slab using lifting devices as shown on the shop drawings.

K. Set approach slab in the proper horizontal location. Check for proper alignment and grade within specified tolerances.

L. Survey the top elevation of the approach slab.

M. Adjust vertical leveling devices prior to full release of the approach slab from the crane. This will reduce the amount of torque required to turn the bolts in the leveling devices. Check for proper grade within specified tolerances.

N. Prevent shifting of the precast approach slab panels during installation.

O. Clean and remove all debris from the areas that are to be grouted prior to placement of the approach slab.

P. Keep bonding surfaces free from laitance, dirt, dust, paint, grease, oil, rust, or any contaminant other than water.

Q. Pre-test grout material installation under field conditions in a similar void mock-up prior to construction of the approach slab to determine grout flowability. Include in the mock-up at least two fill ports that are of the same configuration as the actual bridge.
   1. The Engineer will determine the required corrective action.
   2. Proceed with grouting process at the Engineer's direction.

R. Saturate surface dry (SSD) all surfaces receiving structural non-shrink grout.

S. Mix and place product following manufacturer's recommendations for preparation and installation.

T. Pour or pump grout under the end of the approach slab if shown on the plans. Start from the center of the approach slab and proceed toward the outside edges. Check that grout is filling the entire void between the approach slab and the sleeper slab.

U. Do not apply superimposed dead loads or live loads to the precast approach slabs until the structural non-shrink grout has reached a strength of 500 psi based on manufacturer's published data.

V. Cure structural non-shrink grout per manufacturer's recommendation.
   1. Contact the manufacturer's representative for advice on how to reduce heat such as wet curing or adding retarding admixture if the heat of hydration is excessive.

W. Set prefabricated joint extrusions as shown on the plans.

X. Cast closure pours as shown on the plans.

Y. Cure closure and pour concrete.

3.3 DECK GRINDING

A. Profile grind the deck and approaches after all panels are in place, grouting is complete, and design strength is achieved according to Section 02982.

3.4 SURF ACE PREPARATION

A. Prepare deck and approach slabs and place Polymer Overlay, Type 1. Refer to Section 03372.

END OF SECTION