May 27, 2010

SPECIAL PROVISION

PROJECT #MP-I15-6(178)245
PIN #7037

SECTION 03312S

STRUCTURAL CONCRETE - LIGHTWEIGHT

Add Section 03312:

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Materials and procedures for producing Portland cement concrete using lightweight aggregate for the coarse portion of the mix.

B. Materials and procedures for constructing structural concrete, including box culverts, diversion boxes, catch basins, cleanout boxes and other items as specified.

1.2 RELATED SECTIONS

A. Section 03055: Portland Cement Concrete

B. Section 03211: Reinforcing Steel and Welded Wire

C. Section 03310: Structural Concrete

D. Section 03390: Concrete Curing

1.3 REFERENCES

A. AASHTO M 6: Fine Aggregate for Portland Cement Concrete

B. AASHTO M 195: Lightweight Aggregates for Structural Concrete

C. AASHTO T 104: Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate

D. AASHTO T 121: Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete

E. AASHTO T 196: Air Content of Freshly Mixed Concrete by the Volumetric Method

F. ASTM C 567: Standard Test Method for Determining Density of Structural Lightweight Concrete

G. ASTM C 1260: Standard Test Method for Potential Alkali Reactivity of Aggregates

H. ASTM C 1567: Standard Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate

I. UDOT Materials Manual of Instruction

J. UDOT Minimum Sampling and Testing Requirements

K. UDOT Quality Management Plans

1.4 DEFINITIONS

A. Structural Concrete – Lightweight – a concrete mixture with all attributes equal to structural concrete with exception to weight. Weight is limited to a maximum of 120 lb/ft^3.

1.5 SUBMITTALS

A. Furnish to the Resident Engineer and Region Materials Engineer a mix design based on the recommendations of the lightweight aggregate manufacturer for each combination of materials to be used.
   1. Mix designs will be approved based on results of trial batches or on history from UDOT projects within the last year.
   2. Use the same components in the trial batches that are to be used in the project.
      a) Accelerators and site-added air-entrainment can be incorporated in the trial batch but are not required.
      b) Assume responsibility for the compatibility of all admixtures with the mix design and their potential effects on concrete properties.
   3. List the weight and absolute volume for each component to be used.
   4. Provide certified test reports showing the unit weight of fresh concrete that will result in the air-dry unit weight specified.
   5. Personnel performing and witnessing trial batches, and performing compressive and flexural strength testing, must be UDOT TTQP Concrete and Concrete Strength Testing qualified.
   6. The Department or its representative may witness the trial batch.

7. Mix concrete trial batches as specified in UDOT Materials Manual of Instruction Part 8-974: Guidelines for Portland Cement Concrete Mix Design.
8. Compressive and flexural strength testing for verification of trial batches will be performed by an AASHTO accredited laboratory, approved through the UDOT Laboratory Qualification Program.

B. Provide test results verifying the coarse and fine aggregate used meets this Section, article 2.3.

C. Provide test results for potential reactivity of fine aggregates in accordance with the requirements of the UDOT Quality Management Plan for Ready-Mix Concrete for any proposed mix design.

D. Provide results from appropriate testing to determine the ability of the combinations of cementitious materials and aggregates to control the reactivity when using potentially reactive aggregates in a mix design.

E. Submit verification that cement used is from a pre-qualified supplier. See Section 03055.

F. Submit verification that fly ash or other pozzolan used is from a pre-qualified supplier. See Section 03055.

G. Submit verification that the batch plant meets the requirements of the UDOT Quality Management Plan for Ready-Mix Concrete.

H. Submit cold and hot weather plans as required in Section 03055.

1.6 ACCEPTANCE

A. Refer to Section 03055.

B. Acceptance is in accordance with UDOT Minimum Sampling and Testing Requirements with the following exceptions:
1. Air content will be determined by AASHTO T 196. Field technician for air content assurance must be ACI Level 1 certified by passing a written and performance exam based on the 2008 publication of ACI CP-01.
2. Density of fresh concrete with each air content determination. Refer to AASHTO T 121. The target density is 113 lb/ft^3 (+5 lb/ft^3 or -6 lb/ft^3). The maximum density is 120 lb/ft^3.
3. Provide test results, if fly ash is not used, verifying the expansion of the coarse and fine aggregates does not exceed 0.1 percent according to ASTM C 1260. Provide test results, if fly ash is used, verifying the expansion of the coarse and fine aggregates does not exceed 0.1 percent according to ASTM C 1567.

PART 2 PRODUCTS

2.1 MIX REQUIREMENTS

A. Class AA(AE) concrete, unless specified otherwise. Refer to Section 03055 with following exception.
   1. Slump requirements when using low range water reducers: 1 inch to 5.5 inches.

B. Keep the air-dry unit weight of the mix between 2950 to 3100 lb/ yd^3.
   1. Determine the air-dry weight in accordance with ASTM C 567.

C. Do not allow the fresh concrete to vary more than ± 110 lb/yd^3 from that shown on the mix design.

2.2 CEMENT

A. Refer to Section 03055.

2.3 AGGREGATES

A. Coarse Aggregate
   1. Use lightweight aggregates that are rotary kiln expanded shale or clay having a surface sealed by firing.
      a. Do not crush coarse aggregate after firing except for a small amount of aggregate, ¾ inch or smaller, which may be crushed to the extent necessary to produce the required coarse aggregate grading.
      b. Use coarse aggregate of ¾ inch maximum.
   2. Meet the requirements of AASHTO M 195.
      a. Meet Table 1, gradation band 12.5 to 4.75 mm (½ inch to #4) or 19.0 to 4.75 mm (¾ inch to #4).
   3. Use lightweight aggregates that have not more than 5 percent loss when tested for soundness using Magnesium Sulfate (5 cycles). Refer to AASHTO T 104.

B. Fine Aggregate
   1. Refer to Section 03055.

2.4 WATER

A. Refer to Section 03055.

2.5 ADMIXTURES

A. Refer to Section 03055.

2.6 POZZOLAN

A. Refer to Section 03055.

2.7 REINFORCING STEEL AND WELDED WIRE

A. Refer to Section 03311.

2.8 JOINTS AND SEALERS

A. Refer to Section 03310.

2.9 BACKER ROD

A. Refer to Section 03310.

2.10 WATERSTOPS

A. Refer to Section 03310.

2.11 RIGID PLASTIC FOAM

A. Refer to Section 03310.

2.12 CURING COMPOUND

A. Refer to Section 03390.

2.13 FORMS

A. Refer to Section 03310.

2.14 MISCELLANEOUS STEEL ITEMS

A. Refer to Section 03310.

PART 3 EXECUTION

3.1 PREPARATION - CONCRETE

A. Aggregate Stockpiles
   1. Refer to Section 03055.
   2. Uniformly pre-wet or pre-saturate the aggregates in such a manner that uniform penetration of the concrete will be maintained.

a. Pumping of the concrete requires pre-saturation of the lightweight aggregate.

3.2 BATCH MATERIALS

A. Refer to section 03055.

B. Batch lightweight coarse aggregate either by weight or by volume. If by volume, equip the batching equipment such that the weight of each size of aggregate in the batch can be verified.

C. Do not allow the fresh concrete to vary more than ± 110 lb/yd^3 from that shown submitted with the mix design.
   1. Verify each load using batched weights of materials.

3.3 MIX DESIGN

A. Design mixes to meet the requirements of this Section and project specific criteria.

B. Design the cementitious system to mitigate potential alkali-aggregate reactivity.
   1. Use a minimum of 20 percent by weight of the total cementitious system when using fly ash.

C. Use only concrete mixes that have been approved by the Region Materials Engineer.

D. Obtain concurrence from the Resident Engineer for the project specific application of an approved mix.

3.4 PREPARATION – PLACEMENT

A. Refer to Section 03310.

3.5 GIRDERS, SLABS AND COLUMNS

A. Refer to Section 03310.

3.6 BOX CULVERTS

A. Refer to Section 03310.

3.7 PLACE CONCRETE

A. Refer to Section 03310.

3.8 PUMP CONCRETE

A. Refer to Section 03310.

3.9 LIMITATIONS – GENERAL

A. Refer to Section 03055.

3.10 LIMITATIONS – COLD WEATHER

A. Refer to Section 03310.

3.11 LIMITATIONS – HOT WEATHER

A. Refer to Section 03310.

3.12 CYLINDER STORAGE DEVICE

A. Refer to Section 03055.

END OF SECTION

SPECIAL PROVISION

SECTION 03253S

BRIDGE CONSTRUCTION USING SELF-PROPELLED MODULAR TRANSPORTERS (SPMT)

Add Section 03253:

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Calculations, shop detail drawings, manuals, and engineering data addressing bridge movement during execution as well as monitoring requirements. Also, includes post-movement inspection and remedial action.

1.2 RELATED SECTIONS

A. Section 03310: Structural Concrete

1.3 REFERENCES

A. AASHTO Guide Design Specifications for Bridge Temporary Works, 1st Edition, 2008 Interim Revisions

B. AASHTO LRFD Bridge Construction Specifications, 2nd Edition, 2004, 2008 Interim Revisions

C. UDOT Manual for the Moving of Utah Bridges with Self Propelled Modular Transporters (SPMTs)

D. UDOT Minimum Sampling and Testing Requirements Manual

1.4 DEFINITIONS

A. Change in Longitudinal Gradient Along the Girders – The change in slope experienced along the edge girders from conditions just before first lifting to any time during transportation.

B. Change in Transverse Gradient Across the Girder Span – The change in slope experienced along the end diaphragms from conditions just before first lifting to any time during transportation.

C. Definitions and terminology used with SPMT systems - Refer to UDOT Manual for the Moving of Utah Bridges with Self Propelled Modular Transporters (UDOT SPMT Manual).

D. Twist – The maximum allowable upward or downward deflection of one corner relative to the plane defined concurrently by the elevations of the other three corners.

1.5 SUBMITTALS

A. Submit a schedule addressing the timing and sequence of fabrication and erection of the permanent substructure and superstructure, removal or demolition of the old structure, construction of temporary abutments, connections with the roadway, road closures, and the transportation of the superstructure.

B. Submit working drawings for Engineer approval prior to ordering materials or commencing related work.
   1. Engineer reserves the right to review these drawings for up to five working days without granting an increase in the number of working days for the project.
      a. This right applies each time drawings are submitted.
   2. Bridge Staging Area (BSA) and Travel Path (TP).
      a. Indicate all ground improvements, soft soil mitigation, and utility protection.
      b. Verify clearances from above ground obstacles and provide mitigation.
   3. Selected movement system.
      a. Design the movement system to lift the bridge at the pick points indicated in the project plans.
      b. Demonstrate that the new pick points support the structure within the stress limits indicated on the project plans when lifting the bridge at pick points other than those indicated on the design.
      c. Design the lifting system to provide wheel loads equal to or less than those indicated on the project plans.
      d. Indicate that the selected lifting system possesses adequate stroke to negotiate the TP as designed.
      e. Indicate any additional systems required to move the structure, for example such items may include skid shoes, climbing jacks, and strand jacks.
         1) Demonstrate that stresses provided in the project plans are not exceeded.
      f. Provide pre-operations checklist.
   4. SPMT Support Apparatus

a. Design SPMT Supports to meet AASHTO Guide Design Specifications for Bridge Temporary Works, 1st Edition, 2008 Interim Revisions and 2nd edition 2004 AASHTO LRFD Bridge Construction Specifications, 2008 interim revisions.
b. Calculate the anticipated lateral forces due to for example braking, turning, and vertical grades and provide a system to transfer loads to SPMTs.

5. Temporary abutments
   a. Refer to Section 03310.
   b. AASHTO Guide Design Specifications for Bridge Temporary Works, 1st Edition, 2008 Interim Revisions.
6. QA/QC procedures

C. Submit elected changes to project plans in the form of shop drawings stamped by a professional engineer licensed in the State of Utah.
1. Submit all shop drawings to the Engineer electronically in 11 inch X 17 inch format with the Department project designation data, drawing number, and sheet number in the lower right hand corner.
2. Changes to BSA and TP
   a. Submit VE proposals for changes to BSA and TP.
   b. Provide design of BSA and TP meeting criteria in UDOT SMPT Manual.
3. Changes to Pick-Points
   a. If elected pick points cause stresses exceeding those allowed in the project plans, redesign bridge.
   b. Identify additional project plans affected by the redesign of the structure.
   c. Provide a redesign of any project plans affected by the redesign of the structure.

D. Provide MOT plan and schedule.

E. Contingency plans.

1.6 ACCEPTANCE

A. Acceptance is in accordance with UDOT Minimum Sampling and Testing Requirements.

PART 2 PRODUCTS

2.1 BRIDGE CONSTRUCTION USING MOVEMENT SYSTEMS

A. Provide all materials for the permanent features of the project in conformance with UDOT specifications.

B. Provide all temporary features of the project suitable to sustain applied forces.

C. Contact the Department for qualified product information.

Part 3 EXECUTION

3.1 PREPARATION FOR TRANSPORT OF SUPERSTRUCTURE

A. Follow established and submitted QC/QA procedures.

B. Follow Pre-Operations checklist.

C. Obtain Engineer's approval for all temporary Traffic Control Plans (TCPs) and Traffic Operational procedures prior to transportation.

D. Implement traffic control prior to transportation.

E. Do not exceed the SPMT ground pressures for the supporting capacity of the soil, roadway construction, or any structures over which the load will travel.

F. Follow approved working drawings for the positioning of the SPMTs.

G. Follow specified allowable limits for loss of support by any pair of wheels or axle lines.

H. Implement contingency plans in the event of a major breakdown of equipment to complete the installation with minimal disruption or delay to traffic.

3.2 LIFT, TRANSPORT, AND PLACEMENT OF SUPERSTRUCTURE

A. General

1. Check elevations of bearing seats and tops of bearings prior to lifting bridge.
    a. Notify the Engineer of differences between as-built and as-planned bearing elevation and submit proposals for corrective adjustments.
2. Lift and transport structure in accordance with the lifting points established in the drawings.
3. Deliver the structure to its final location with no damage or loss of strength, performance, or long-term durability.

B. Monitoring
   1. Monitor the span for stability and integrity of the SPMT system during lifting, transport, and placement following the plans for the equipments and methods of monitoring.
   2. Monitor deflection and twist control during transportation.
   3. Obtain deflection and twist tolerances from the Engineer.
   4. Provide measurements to the Engineer for actual deflection and twist during lift, transport, and setting.
   5. Halt operations immediately if deflection or twist exceed allowable limits as designed by the Engineer, returning bridge to temporary supports if necessary.

C. Tolerances
   1. Plan alignment, location, and clearances for the final condition of the span after placement.
   2. Do not exceed 2 inches for spans under 100 ft, and 3 inches for spans over 100 ft at each end of the span for maximum deviation from overall longitudinal alignment of an individual span after setting.
   3. Do not exceed 2 inches for spans under 100 ft, and 3 inches for spans over 100 ft for maximum deviation from the overall transverse location at each line of bearing.
   4. Do not exceed 2 inches for spans under 100 ff, and 3 inches for spans over 100 ft for maximum yaw.
   5. Maintain individual elements or surfaces within 2 inches for spans under 100 ft, and 3 inches for spans over 100 ft of location with respect to similar matching surfaces at expansion joints (plane of web parapet) of adjacent spans, pier or abutment features in the absence of other constraints.
   6. Provide the maximum allowable change in longitudinal gradient. along the girders.
      a. Calculate change from differences between the elevations taken just before lifting and the elevations taken at any time during transport.
   7. Provide the maximum allowable change in transverse gradient across the girder span.
      a. Calculate change from differences between the elevations taken just before lifting and the elevations taken at any time during transport.

END OF SECTION