MINUTES OF 2008 STRUCTURE WORKSHOP

The 2008 Structure Workshop was held on May 7th in the Structure Design Unit Conference Room C in Raleigh. Those in attendance included:

Greg Perfetti	State Bridge Design Engineer
Tom Drda	FHWA Division Bridge Engineer
Dan Holderman	State Bridge Management Engineer
Dave Henderson	State Hydraulics Engineer
Cecil Jones	State Materials Engineer
Mike Robinson	State Bridge Construction Engineer
Njoroge Wainaina	State Geotechnical Engineer
Jay Bennett	State Roadway Design Engineer
Allen Raynor	Assistant State Bridge Design Engineer
Tom Koch	Assistant State Bridge Design Engineer
Ernesto Villalba	FWHA – Assistant Division Bridge Engineer
Donna Dancausse	FHWA – Quality Coordinator
Brian Hanks	Structure Design Project Engineer
Gichuru Muchane	Structure Design Project Design Engineer
Victor Chao	Structure Design Engineer
Alan Chan	Structure Design Engineer
David Snoke	Structure Design Engineer
Darren Scott	Bridge Construction Engineer
Kevin Bowen	Bridge Construction Engineer
Lee Puckett	Bridge Construction Engineer
Moy Biswas	Research and Analysis – Assistant Branch Manager
Neal Galehouse	Research and Analysis – Research Engineer
Jack Cowsert	Materials and Tests – State Materials Quality Engineer
David Greene	Materials and Tests – Structural Members Engineer
Chris Peoples	Materials and Tests – Chemical Testing Engineer
Trudy Mullins	Materials and Tests – Prestressed Concrete Engineer
K.J. Kim	Geotechnical Eastern Regional Manager
Scott Hidden	Geotechnical Support Services Supervisor
Chris Kreider	Geotechnical Eastern Regional Operations Engineer
Dean Hardister	Geotechnical Western Regional Operations Engineer
John Fargher	Geotechnical Western Regional Design Engineer
Bill Goodwin	PDEA – Bridge Development Unit Head
Bryan Kluchar	PDEA – Project Planning Engineer Supervisor
Pam Williams	PDEA – Project Planning Engineer

The following items of business were discussed:

1. WELCOME:

The workshop kicked off with self-introductions.

Mr. Drda welcomed all attendees to the meeting, noting that the Structure Workshop, Spring Tour and the Structure Topics meetings open up lines of communication between various disciplines within the Department, and he noted that these forums are excellent examples for other groups and units to

follow. Mr. Drda also briefly discussed the Department's current focus on the bridge program and the challenge of implementing the changes recommended by the Transformation Management Team (TMT).

*2. **REVIEW OF THE 2007 ACTION ITEMS*** *(STRUCTURE DESIGN)*

Mr. Perfetti began the meeting with a review of the outstanding action items from the 2007 Structure Topics meeting.

The status of the action items was reported as follows:

- **Screeding on Skews** – Structure Design has delivered sample header data and cross-section sketches to the Construction Unit. Construction will review and provide comments soon.
- **CSL Tubes** – The Geotechnical Engineering Unit (GEU) will be distributing a draft CSL policy soon for review and comments. GEU still has some concerns on lack of redundancy when the tubes are omitted.
- **Roadway Brining & Drip Bead** – It was suggested that the Department investigate whether roadway brining is really a problem for bridges and if so, quantify the chloride loading and demonstrate its effect. The Research Unit will develop a problem statement.

  Structure Design has developed a drip bead detail, which has been used on several projects.
- **LRFD Implementation** – Structure Design has now implemented LRFD design. Bridges design by LRFD Specification will be rated by LRFR specifications. FHWA will assist the Department with LRFD substructure design training in July and LRFR training in November.
- **Bat Bridges** – The Department will not pursue accommodating bat habitat in the vicinity of or on bridges due to health concerns.
- **Railroad Flagging** – This issue has been discussed with Contractors at the AGC-DOT Committee meeting. Structure Design has been working with Project Services to develop and let contracts with trial alternate methods for payment for railroad flagging. Under the proposed special provision for railroad flagging the Department will offer monetary incentives/disincentives for under or over-running the allowed flagging days, thereby providing an incentive for the contractor to minimize flagging.
- **Bridge Demolition Debris** – PDEA will be developing the means to advertise bridge demolition debris. FHWA would like to set a target date for implementation.
- **Pile Jetting** – GEU is still considering the development of guidelines for implementing the results of the research. The discussion suggested sharing the research with the agencies, such as DWQ, and emphasized the need complete a pilot project to demonstrate the criteria for successful jetting.
- **Integral Abutments** – Construction reported on the challenges of building cribbing for screed rails in the excavated areas of the integral abutment. There was a suggestion to allow building the approach fill once the girders are placed. There was some discussion on the merits of building a fabric wall that would also serve as the formwork at the fill face of integral abutment.
- **Welding SIP Forms –** The Materials and Tests Unit reported that they are waiting for submittals to determine Contractor preference for welding or strapping SIP forms in the negative moment regions of steel girders.
- **Fastener Inspection Certification –** The Materials and Tests Unit reported that this program has been implemented.
- **Anchor Bolt Tightening –** All Units were reminded that the Traffic Unit's new special provision for anchor bolt tightening is included in project contract plans.

- **Painting Structures for Aesthetics –** There was some discussion on the requirement to paint closed drainage systems for aesthetics and UV protection, in lieu of utilizing ASTM 3808 [green] pipe which has better UV protection than PVC pipe. However, paint on PVC pipe would not last long, which would create a maintenance problem. There was consensus to use the green pipe for future projects with a closed drainage system.
- **Z-Bar and Rhino Deck –** The product manufacturers continue to make requests to use their product on a Project. It was agreed that the Department would not pursue usage.
- **CNI Acceptance –** There was a suggestion to consider using Calcium Nitrite Inhibitor (CNI) in all bridge decks as a cost-effective way to reduce deterioration due to corrosion. The discussion noted that CNI admixture affects slump and requires verification by an Inspector.

3. ***SUB-REGIONAL TIER DESIGN GUIDELINES:*** *(ROADWAY & STRUCTURE DESIGN)*

Mr. Bennett gave a presentation on the *Sub-Regional Tier Design Guidelines for Bridge Projects*. He noted that the procedure for implementing the guidelines was a tri-managed process involving the Bridge Project Development Unit, the Highway Design Branch, and the Division Staff. Mr. Bennett gave an overview of the contents of the *Sub-Regional Tier Design Guidelines for Bridge Projects* document, which has been approved by the State Highway Administrator and the Federal Highway Administration. He discussed some of the considerations that will be made by the Planning Unit and each of the Highway Design Units.

Mr. Raynor reported on the status of implementing some of the recommendations. He distributed a spreadsheet that documented over 1.7 million dollars in savings that the Department can immediately realize by realigning the scope of ten bridge replacement projects to fit the sub-regional tier design guidelines. Mr. Raynor noted that these savings represent the first phase of this effort. The second phase will target projects in the design pipeline that will be let prior to June 2010.

Action Item(s):

- PDEA and the Highway Design Branch Design Units will disseminate and implement the sub-regional tier design guidelines within their respective units.
- All Highway Design Units will continue to identify and revise plans for projects where cost saving can be realized through use of the sub-regional tier design guidelines.
- All Highway Design Units will set up a web page showing the regionalization plan.

4. ***TRANSFORMATION TEAM RECOMMENDATIONS:*** *(ROADWAY & STRUCTURE DESIGN)*

Mr. Raynor also briefly discussed efforts geared towards meeting the State's current and future transportation needs by way of improved project delivery times. Some of these efforts include lumping similar small projects within the same geographical area and letting them together, and preparing contract plans for small bridge replacement projects to reflect the "look and feel" of Purchase Order Contracts (POC) with limited approach roadway work.

Mr. Bennett stated that the Transformation Management Team had recommended the Department implement a regionalization plan that would streamline communication between the Divisions and the Highway Design units. He distributed a list showing the primary contact personnel for each design unit under the regionalization plan.

Action Item(s):

- None

5. RESEARCH IN PROGRESS: *(RESEARCH & ANALYSIS)*

Mr. Galehouse discussed the status of current research projects. He stated that there are six projects in progress and twelve recently completed projects. He gave a brief description of each of the eighteen projects, thanked all Units for their participation in the research program, and he encouraged all units to start preparing their research ideas for the next research cycle.

Action Item(s):

- None

6. PRECAST SUBSTRUCTURE DESIGN: *(STRUCTURE DESIGN)*

Mr. Hanks briefly discussed the successful use of precast bridge elements on a recent project on NC-12 on Ocracoke Island where seven bridges were replaced and NC-12 was reopened ten days ahead of schedule. The Ocracoke project and previous precast projects have demonstrated that precast bridge systems have a role in shortening project delivery times and should be more widely used where possible. He added that Structure Design will seek opportunities to employ precast bridge elements more often, such as fast track projects, with details and ideas derived from the Ocracoke project.

Action Item(s):

- Construction will develop a list of Ocracoke keys to success and possible improvements.
- Structure Design will utilize precast bridge elements where it is beneficial, and develop standard precast substructure details.

7. STANDARDIZED CORED SLABS: *(STRUCTURE DESIGN)*

Mr. Raynor gave a presentation on the standardized cored slab designs initiative. He noted that this initiative was among the Transformation Management Team (TMT) work stream action items developed through the Bridge Team. The presentation highlights were as follows:

- Standardized plans for cored slab bridges will be a useful tool for Division Track sub-regional tier bridge projects.
- Standardized cored slab designs will yield better design consistency and provide larger production runs for producers of concrete bridge elements.
- The Department will cluster projects that are in close geographical proximity, which will yield economies of scale in mobilization and equipment costs for contractors.
- Clustering projects with standardized plans will derive cost saving from economy of scale.
- This approach will streamline cost efficiencies and should translate into improved project delivery performance.

Mr. Raynor noted that Structure Design is currently developing standardized cored slab bridge plans and selection of trial projects is in progress.

Action Item(s):

- Structure Design will complete standardized cored slab designs, prepare standardized plan sheets, select trial projects and implement standardized plans on clustered projects.

8. GIRDER DEFLECTIONS: *(STRUCTURE DESIGN)*

Mr. Hanks stated that Structure Design has been using the new procedure for modifying single-girder-line non-composite dead load deflections for more than a year. The new procedure, which was a product of a research project, was implemented to address construction issues related to inaccuracies of predicted girder deflections for steel bridges.

Mr. Hanks invited the Bridge Construction Engineers to comment on the deflection predictions now shown in the plans. There was consensus that the new deflection predictions had curtailed some of the deflection related construction problems.

Action Item(s):

- None.

9. PRESTRESSED PILE BUILD-UP DETAILS: *(CONSTRUCTION)*

The Construction Unit stated that some Contractors have requested and received approval to use the South Carolina prestressed pile build-up detail. As such, Construction suggested Structure Design incorporate the South Carolina build-up detail as an option on the contract plans.

Action Item(s):

- Structure Design will discuss and review the build-up detail for possible adoption on the structure standard drawings.

10. DRILLED PIER CASING REMOVAL: *(CONSTRUCTION)*

The Construction Unit stated that Contractors have had a lot of problems with removal of temporary drilled pier casing when dry holes in wet conditions are required prior to placing concrete. There was some discussion on the causes of the problems which were attributed to insufficient piezometric head when there is only 10 feet of concrete in the drilled pier prior to removal of the casing. It was recommended that Drilled Pier special provision be revised to require a piezometric head of one-half of the drilled pier height prior to casing removal.

Action Item(s):

- The Geotechnical unit will evaluate the recommendation to require a piezometric head of half the drilled pier height prior to casing removal.

11. EXCAVATION & BRIDGE REMOVAL FROM EDGE OF BANK: *(CONSTRUCTION)*

The Construction Unit reported that on bridge replacement projects it is often beneficial to leave the existing bridge substructure intact or only partially remove it to maintain stability of the stream bank. However, sometimes permits require complete removal and there appears to be no consensus among regulatory agencies on when the existing structure should be removed. The Construction Unit suggested that the stream banks be evaluated and discussed at the preliminary field inspection. In general the Construction Unit's recommendation is partial removal of existing substructure to the toe of the bank slope to prevent unraveling/instability of the slope, unless full removal is necessary for other reasons.

Action Item(s):

- None

12. PRECAST AESTHETIC BRIDGE RAIL: *(CONSTRUCTION)*

The Construction Unit discussed the potential time savings that could be realized from using a precast rail for locations that required a rail with aesthetic features. Construction suggested the Structure Design Unit develop details for a precast Texas Classic rail. The discussion noted that all bridge barrier rails must meet stringent crash test or crash test equivalent requirements and must be approved by FHWA. In the case of precast rails, the connection details present the greatest challenge in meeting the crash test equivalent requirements.

Action Item(s):

- Structure Design will investigate the feasibility of developing a precast crash test equivalent Texas classic rail.

13. BCE COMMENTS ON PRELIMINARY DESIGNS: *(CONSTRUCTION)*

Mr. Koch discussed a recent project where the draft bridge span layout was sent to the area Bridge Construction Engineer (BCE) for his review and comments. The BCE requested changes when he received the final Bridge Survey Report (BSR), which raised a work flow issue in the Plan and Permit Review Process. Structure Design eventually agreed with the BCE and the suggested revisions were made.

There was some discussion on the appropriate phase, during the Plan and Permit Review Process, for revisions to the bridge layout. It was noted that the most recent changes to the milestones of the review process does not permit changes once the final BSR has been sent out. It was therefore agreed that all changes should be made to the draft layout prior to distribution of the final BSR. Structure Design will send the proposed layout to the area BCE for review and comments.

Action Item(s):

- None.

14. STAGED CONSTRUCTION FALSEWORK: *(CONSTRUCTION)*

The Construction Unit discussed problems with meeting the rideability specifications when on a staged construction bridge the Contractor supports the formwork for stage II on the completed stage I. There was some discussion on the challenges faced when a standard closure pour width is detailed between stages, which noted that a wider closure pour would be necessary to construct both stages independently if standard overhang brackets were used.

The Structure Design and Construction Units were not in favor of a wider closure pour. There was consensus that the Department needs to explicitly require screed supports for stage II deck pours to be independent of stage I. The Construction Unit will bring this topic up for discussion with the Contractors at the next AGC-DOT Joint committee meeting.

Action Item(s):

- Structure Design will investigate the need to explicitly require screed supports for stage II deck pours to be independent of stage I.
- Construction will discuss this topic with Contractors at the June 2008 AGC-DOT Joint committee meeting.

15. HEAVY SKEWED CORED SLAB BRIDGES: *(MATERIALS AND TESTS)*

The Materials and Test Unit discussed issues related to cored slab units for bridges on heavy skews. They reported that heavy skew cored slab units tended to twist and therefore did not sit flat on the end bent, which require corrective measures such as using shims. Differential camber was also reported to often exceed the Standard Specifications limits.

There were suggestions to mitigate the problems such as using thicker elastomeric pads, a plan note to provide guidance to field personnel, and allowing Contractors to shift units and re-match mark and require them to accept responsibility for the condition of the units in writing. The discussion noted that there are many factors that influence girder twisting and camber, and therefore it was difficult to pinpoint the cause(s). There was consensus to raise awareness of the issue among the Department's inspectors and Contractors, and to remind the inspectors to be extra attentive to QA/QC requirements during all stages of production and construction.

Action Item(s):

- Materials and Tests Unit will remind the inspectors to be extra attentive to the Standard Specifications requirements during all stages of production and construction.

16. TRANSVERSE POST-TENSIONING HOLES ON CORED SLABS: *(MATERIALS AND TESTS)*

The Materials and Tests Unit stated that concrete producers have requested the Department consider routinely utilizing 0.6" ϕ strands for prestressed girders, box beams, and cored slabs. In addition, the producers have requested the Department detail 3" ϕ dowel holes and transverse post-tensioning holes for cored slabs and box beams.

Action Item(s):

- Structure Design will investigate the feasibility of routinely employing 0.6" ϕ strands and detailing 3" ϕ dowel and transverse post-tensioning holes.

17. GALVANIZING REPAIRS: *(MATERIALS AND TESTS)*

The Materials and Tests unit reported that they are currently evaluating a new product, Galva-guard, which is a heat applied zinc solder for repairing galvanizing. The product manufacturer is prepared to perform demonstrations for anyone in the Department who is interested in the product.

Action Item(s):

- None.

18. WORKSHOP ON EPOXY COATED REBAR: *(MATERIALS AND TESTS)*

The Materials and Tests Unit reported that CRSI will be offering a half-day workshop on epoxy coated rebar, for anyone who is interested.

Action Item(s):

- None.

19. OTHER: *(GENERAL)*

There was some discussion on when it is appropriate to use the recently adopted vertical concrete parapet bridge rail. The following guidance for using the rail was provided:

- Through-the-rail drainage is required on the bridge,
- Sub-regional tier bridges, and
- There is the potential eliminate a line of cored slab or box beam units.

20. SPRING FIELD REVIEW ITINERARY: *(STRUCTURE DESIGN)*

Mr. Hanks distributed a proposed itinerary for the Spring Field Review tour. He gave a brief overview of the itinerary. He also welcomed suggestions for additional sites of interest that were in the vicinity of the basic itinerary.