MINUTES OF 2004 STRUCTURE WORKSHOP

The 2004 Structure Workshop was held on April 13th in the Bridge Maintenance Unit Conference Room in Raleigh. Those in attendance included:

Greg Perfetti	State Bridge Design Engineer
Njoroge Wainaina	State Geotechnical Engineer
Ron Hancock	State Bridge Construction Engineer
Jay Bennett	State Roadway Engineer
Rodger Rochelle	State Research Engineer
Ernesto Villalba	FHWA-NC
Ricky Keith	Assistant State Bridge Design Engineer
Allen Raynor	Assistant State Bridge Design Engineer
John Emerson	Assistant State Bridge Maintenance Engineer
Tom Koch	Structure Design Project Engineer
Gichuru Muchane	Structure Design Engineer
David Stark	Structure Design Engineer
Scott Hidden	Geotechnical Support Services Supervisor
John Fargher	Geotechnical Western Regional Design Engineer
Jack Cowsert	State Materials Quality Engineer
Chris Peoples	Materials and Tests Chemical Engineer
David Greene	Structural Members Engineer
Brian Hunter	Materials and Tests Engineer
Owen Cordle	Materials and Tests Engineer
Mike Robinson	Bridge Construction Engineer
Max Buchanan	Bridge Construction Engineer
Billy Trivette	Bridge Construction Engineer
Cameron Cochran	Bridge Construction Engineer
Rick Nelson	Bridge Construction Engineer

The following items of business were discussed:

1. INTRODUCTION:

Mr. Koch welcomed all in attendance. Mr. Villalba provided some opening remarks in which he encouraged all units representing different disciplines in transportation systems to support and encourage one another. Mr. Koch also introduced Mr. Gichuru Muchane, Structure Design - Engineering Development Squad Leader.

2. PRESENTATION - NEW APPROACH SLAB/BARRIER RAIL DETAILS: (STRUCTURE DESIGN)

Mr. Muchane presented an overview of recent policy memoranda issued by Structure Design. The presentation covered changes to the concrete cover for the reinforcing steel in New Jersey shape barrier rails, the increase in overhangs on bridge decks, and the transition to 25'-0" approach slabs. For the longer approach slabs, the New Jersey

barrier rail transition length will remain at 12'-0" and the remaining length of approach slab shall be detailed with a 4" curb similar to a shoulder berm gutter. As a result of the longer approach slabs, some drainage structures may be located in the approach slab. The presentation showed some visualizations of drainage structures that may be located on the approach slabs. Mr. Koch explained that a survey of approach slab lengths in other states revealed that North Carolina had some of the shortest approach slabs in the country. Mr. Perfetti added that the longer approach is one of several proposed improvements to bridges in North Carolina, which fit in well with the long-term goal of reducing the number of joints and detailing integral abutments.

The Bridge Construction Engineers suggested that Structure Design consider alternatives to placing drainage structures in the approach slab, since it causes many constructibility problems. They stated that it was much more preferable to move the drains off the approach slab while keeping the outlet pipes located at the stationing shown on the permits.

Mr. Robinson inquired if construction elevations on approach slabs will be provided and at what locations. Mr. Muchane stated that Structure Design shall continue to provide construction elevations at the top of slab/bottom of triangular curb for the outside edges of the approach slab, and the top of approach slab along the work line.

Mr. Villaba inquired why a 4" curb was required on the approach slab. Mr. Bennett responded by stating that the 4" curb is part of the guardrail configuration that was tested under the NCHRP-350 research report, and it needed to remain in order to be compliant with the report's recommendations.

Mr. Hancock sought clarification on whether contractors can incorporate the increased overhangs on projects already let. Mr. Perfetti stated that he had no objection. Mr. Raynor stated the contractors should be aware that they will need to make modifications at the end bents to accommodate the increased bridge width.

Mr. Hidden stated that with the longer approach slabs, the fabric used for the reinforced approach fill will need to be oriented parallel to the centerline of the approach slab, instead of perpendicular to the fill face. This method is also favorable for staged construction. He added that the same method should be used for standard fabric or wire walls when used in lieu of sheet pile shoring. Mr. Hidden noted that the Geotechnical Engineering Unit was developing a standard detail for fabric and wire walls. Mr. Hancock suggested placing a note on the plans to show minimum 4'-0" lap in the geofabric. *The Geotechnical Engineering Unit agreed to work with the Design Services Unit to change the roadway standard and give the contractor the option to use a fabric or wire wall for shoring the bridge approach fill during staged construction.*

There was some additional discussion on ways to position the backfill drainage outlet pipe and/or outlet pad, especially on staged construction projects. Specifically, the

Bridge Construction Engineers suggested not draining the approach fill on to the slope protection because of the potential to stain the slope protection. Mr. Buchanan inquired if end bent weep holes were necessary since the backfill material is typically expected to drain via the 4" perforated drainpipe. *Structure Design agreed to review whether the weep holes were necessary*.

3. *PRESENTATION - BOX GIRDERS:* *(STRUCTURE DESIGN)*

Mr. Koch presented a general overview of a concrete box girder system that Structure Design is adopting. In response to a question from Bridge Maintenance, Mr. Perfetti stated that girders would be detailed with a 3 - 4 inch concrete overlay in lieu of an asphalt overlay. He added that the concrete overlay in conjunction with conventional evazote joints would possibly enable us to eliminate reflective cracks that develop in asphalt overlays. Effectively, the maintenance required would be minimized. If the cored slab units were fabricated, grouted, and post-tensioned correctly then there should be negligible transverse or longitudinal reflective cracks.

4. *CONCRETE OVERLAY ON CORED SLABS:* *(STRUCTURE DESIGN)*

Mr. Cochran presented some slides of the first concrete overlay operation on a cored slab bridge. The contractor placed the screed rails on the parapet for a 2-bar metal rail. The slides showed that the screed tended to splash a significant amount of the concrete overlay mix on to the vertical faces of the parapet. Mr. Perfetti inquired if any longitudinal reflective cracking was observed. Mr. Cochran stated that to date no cracks had been observed in the concrete overlay. Mr. Perfetti noted that the absence of cracks suggested that the grout in the shear keys was ensuring the slabs did not deflect independently, even though, for load distribution considerations, the LRFD Design Specifications do not require shear keys to be grouted if the cored slab units are post-tensioned together. After some discussion on the benefits of concrete overlays and ways to improve the application process, the following was suggested: *1.) Special consideration should be given to keeping the barrier rail clean when placing the overlay, 2.) Place a note on the plans requiring the contractor to submit screed rail support details, and 3.) The concrete overlay should be paid for on a square yard basis.*

5. *SHORT COLUMNS ON DRILLED PIERS:* *(STRUCTURE DESIGN)*

Mr. Koch discussed Structure Design's policy on mechanically spliced reinforcement in short columns on drilled piers. The current detail shows the couplers staggered at 2'-0" and 3'-0" above the construction joint between the drilled pier and the column. However many projects are detailed with inconsistent stagger lengths. The Bridge Construction Engineers stated that reinforcing steel cages are usually very congested. They suggested increasing the staggered distance between couplers from 1'-0" to 1'-6". *Structure Design will revise the policy on the staggered distance between couplers*. In addition the Bridge Construction Engineers inquired if it was necessary

to hook all of the column reinforcing steel that is embedded in the bent cap as this area tends to become extremely congested. They noted that reinforcing steel in precast units are not hooked. *Structure Design will investigate the proportion of reinforcing steel that should be hooked in the cap.* The Bridge Construction Engineers also pointed out that the reinforcing steel in the drilled pier is detailed with an extra 3'-0" length. However the spiral reinforcement is detailed for the height of drilled pier and column. In situations where the extra length of rebar is utilized, then the spiral reinforcement does not extend over the entire length of drilled pier and column. *They suggested Structure Design add a plan note clarifying the intent to allow 3'-0" of rebar without spiral reinforcing at the bottom of the drilled shaft, and that a permitted construction joint is allowed at 1'-0" above the ground line when permanent casings extend all the way to the bottom of the cap*.

6. OTHER STRUCTURE TOPICS: *(STRUCTURE DESIGN)*

Mr. Hidden stated that in some situations where the Geotechnical Engineering Unit allows optional larger temporary casings on short drilled piers, the bent cap is sometimes narrower than the drilled pier. Structure design details all caps a minimum of 8 in. wider than the diameter of the drilled pier/column. After some discussion it was felt that the 4 in. cap overhang was adequate and Structure Design's practice should be left as is.

7. COATING/WELDING INSPECTION TRAINING: *(MATERIAL AND TESTING)*

Mr. Peoples stated that he was in the process of developing a short course on Coatings Inspection. The course topics will include lead abatement, environmental issues, and quality control. Mr. Peoples inquired if there was a great need for such training for the Division staff and how often the course should be offered. Mr. Emerson stated that the Maintenance Unit generally relies on the Construction Unit for contract administration. Mr. Hancock suggested that perhaps the class should be offered in response to the Division's needs, and not at a set frequency. Mr. Hancock inquired whether the course would lead to any certification and whether the course would be appropriate for the Construction Engineering and Inspection (CEI) firms that NCDOT hires for inspection services. Mr. Peoples responded by stating that CEIs could be invited to attend the course. The discussion concluded that the Materials and Tests Unit would contact the Division offices, since they would decide which staff needs the training.

During the discussion on the Coatings Inspection course, Mr. Greene stated that it was very important that the Resident Engineers receive training and in general become more knowledgeable on welding and welding procedures. He stated that a class on visual inspection of welds is offered.

8. THICKNESS OF ELASTOMERIC BEARING PADS: *(MATERIAL AND TESTING)*

Mr. Greene stated that the Materials and Tests Unit have recently come across a cored slab bridge that was detailed with an 11/16" thick bearing pad. He inquired if, in such situations, it was permissible to replace the bearing pad with a 5/8" thick pad. Mr. Koch stated that a 5/8" bearing pad would be acceptable. *Structure Design agreed to detail elastomeric bearing thickness in 1/8" increments.*

9. GALVANIZED BOLTS ON SIGN STRUCTURES: *(MATERIAL AND TESTING)*

Mr. Greene stated that a few plans for sign structures are still detailed with hot-dipped galvanized bolts instead of mechanically galvanized bolts. Mechanically galvanized bolts are preferred because hot-dipped bolts generally have burrs that prevent proper threading. Mr. Greene requested that all sign structure shop drawings indicate the mechanically galvanized bolt requirement. *Structure Design agreed to discuss this issue with the working drawing approval group. If there are questions on previously approved shop drawings, M&T Inspectors should contact Paul Lambert.*

10. MARKINGS ON PRESTRESSING STRAND: *(MATERIAL AND TESTING)*

Mr. Greene stated that current specifications stated that all prestressing strands should be designated with a paint mark at every 100 ft. He suggested that since the majority of prestressing strand used today is low relaxation ("low-lax") strand, then only strand other than "low-lax" should be marked. In other words, if the strand is not marked, then assume it is "low-lax", otherwise a paint mark will indicate what type of strand it is. There was no objection to this suggestion.

11. ***CONSISTENCY IN REFERENCING EPOXIES AND REPAIR MATERIAL:*** *(MATERIAL AND TESTING)*

Mr. Cordle stated that there were inconsistencies in referencing epoxies and repair materials. He suggested referencing the NCDOT Standard Specifications (Section 1081, page 10-164) rather than a specific ASTM designation, e.g. C881. Mr. Cordle added that there is a list of repair materials, non-shrink/non-metallic grouts, and epoxy on the Materials and Tests Unit's website.

12. COMMUNICATION ABOUT UNIQUE MATERIALS PRIOR TO INCLUSION IN PROPOSALS FOR LETTINGS: *(MATERIAL AND TESTING)*

Mr. Cordle stated that the proper channel for communication on unique materials prior to inclusion in proposals for lettings is through the New Products Committee.

13. CORROSION MONITORING OF MSE WALLS: *(MATERIAL AND TESTING)*

Mr. Peoples stated that the Materials and Tests Unit maintains a database on corrosion monitoring of old and new MSE Walls throughout North Carolina. Mr. Peoples inquired if anyone was interested in the data they collected. Mr. Wainaina responded by stating that the Geotechnical Engineering Unit is interested in the data, and that Mr. Hidden would contact them at a later date, when his time permits him to analyze the data. There was further discussion on whether an inventory of all MSE walls exists, and whether it was necessary to monitor the walls built since the specification on #57 stone used in MSE walls was implemented. No action was agreed upon.

14. USE OF SCC: *(MATERIAL AND TESTING)*

Mr. Greene provided an update on the use of Self Consolidating Concrete (SCC). A new admixture from W.R. GRACE seems to have helped overcome problems with aggregate segregation observed in some of the first trial mixes. Thus far, SCC has been used in the substructure of the pedestrian bridge over Wade Avenue, now under construction in Wake County. In addition, S&G Prestress has completed successful mock-up pours of Type IV girder sections. It is anticipated that full girders, which will be subsequently subjected to full load testing, will be poured between May 4-6.

15. ***PROCESS IMPROVEMENT FOR INSTALLATION OF FOUNDATIONS AND STRUCTURE MEMBERS FOR OH SIGNS, HIGH MAST LIGHTING, SIGNAL POLES:*** *(CONSTRUCTION)*

Mr. Hancock discussed issues related to electronic submittals by consultants and contractors. He stated that submittals sent via email often contain very large files that lock up some computers. He suggested authorizing contractors and consultants to send large files to the ftp server. They would then send an email to the recipient informing them that the submittal is available for review. The benefits of electronic submittals are savings in time; the department absorbs the costs of printing.

Mr. Hancock discussed the need to work with the Signals and Geometrics Unit to standardize details for foundations of overhead sign structures. He added that sign structure specifications have been implemented, with the Geotechnical Engineering Unit providing boring data and contractors designing their own foundations. There was some discussion on using successful foundation designs for similar soil conditions. *Scott Hidden agreed to schedule a meeting to discuss/implement uniform specifications and procedures for signs, lighting, and signal poles.*

16. TARGETING JOBS FOR ACCELERATED CONSTRUCTION TECHNIQUES: *(CONSTRUCTION)*

Mr. Hancock stated that there is now more interest in accelerated construction techniques. He requested suggestions for projects that would be suitable candidates

for rapid construction, and that when a potential project is identified all units communicate from the early stages of the project.

17. THE USE OF UNARMORED ELASTOMERIC JOINTS ON LOW ADTT ROUTES: *(CONSTRUCTION)*

Mr. Hancock stated that the use of unarmored elastomeric joints, in lieu of sawed joints, on low ADTT routes has been very promising. As a result there is now a research project in progress [NC 24 over the White Oak River] that will investigate the specific material properties that are important for this application. Since the material is very expensive, the research project will examine the optimal joint block out dimensions as well as recommend a sampling and testing regimen that can be routinely used for quality control. It is anticipated that elastomeric concrete will be utilized more extensively especially with the implementation of integral jointless bridges.

18. FORMAL TRACKING OF SPECIAL PROJECTS: *(CONSTRUCTION)*

Mr. Koch informed the attendees that his project group tracks the performance of experimental products such as Inverseal, Tex-Cote, and Fast Clad paint systems, as well as newly implemented details or bridge types. He stated that, in the future, the tracking spreadsheet would be placed on the Structure Design web site. The attendees were asked to submit additional sites for the database.

19. OTHER CONSTRUCTION TOPICS: *(CONSTRUCTION)*

- **Steel Prices** – Mr. Hancock stated that demand for steel raw materials by foreign sources have resulted in a rapid increase in the cost of steel. In addition, most fabricators are operating under a quantity allocation system, which has increased delivery times. These events are affecting the construction industry. Mr. Perfetti reported that the FHWA have stated that they will not negotiate for additional payments on let contracts. However, AASHTO was looking at publishing an advisory for providing some relief to contractors.
- **Shotcrete Application** - *Mr. Trivette suggested issuing a Special Provision that limits the time between preparation and application of shotcrete on a soil nail wall. He suggested 72 hours as a reasonable time period.* He cited a situation where it has been several months since the preparation work was completed and the shotcrete has still not been applied. He stated that the preparation work would have to be redone.
- **Class II Finish** – The Bridge Construction Engineers inquired if we can require a Class II finish on all concrete exposed surfaces, such as columns, bent cap faces and barrier rails. A class II finish will improve the uniformity of the very visible surfaces. *Structure Design stated they would review the requirements for exposed concrete surfaces*.
- **Retaining Walls** - The Bridge Construction Engineers inquired about the policy on building retaining walls. They stated that there are situations where the

Department had constructed a $300,000 wall to protect a $50,000 home. The Geotechnical Unit stated that often the location of retaining walls is determined by the available right-of-way.

20. FHWA TOPICS *(FEDERAL HIGHWAY ADMINISTRATION)*

Mr. Villalba discussed a recent FHWA survey, and suggested that all disciplines involved could become more visible by encouraging and supporting one another, speaking with a unified voice, and getting involved early on in the planning stages of transportation projects.

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

Mr. Koch distributed a proposed itinerary for the Spring Field Review tour.