

MINUTES OF THE 2007 STRUCTURE TOPICS MEETING

The 2007 Structure Topics Meeting was held on December 10th in the Bridge Maintenance Conference Room in Raleigh. Those in attendance included:

Greg Perfetti	State Bridge Design Engineer
Njoroge Wainaina	State Geotechnical Engineer
Dan Holderman	State Bridge Maintenance Engineer
Dave Henderson	State Hydraulics Engineer
Mike Robinson	State Bridge Construction Engineer
Jay Bennett	State Roadway Design Engineer
Ricky Keith	Assistant State Bridge Design Engineer
Allen Raynor	Assistant State Bridge Design Engineer
Ernesto Villalba	FWHA-Assistant Division Bridge Engineer
Tom Koch	Structure Design Project Engineer
Gichuru Muchane	Structure Design Project Design Engineer
Alan Chan	Structure Design Engineer
David Snoke	Structure Design Engineer
Max Buchanan	Bridge Construction Engineer
Lee Puckett	Bridge Construction Engineer
Rick Nelson	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
Scott Hidden	Geotechnical Support Services Supervisor
Bill Goodwin	PDEA – Bridge Development Unit Head
Nilesh Surti	Design- Build Engineer

The following items of business were discussed:

1. WELCOME:

The workshop kicked off with self-introductions.

Mr. Perfetti welcomed all attendees to the meeting noting that the Structure Topics meeting was an opportunity to report on the status of action items identified approximately 6 months ago at the Structure Workshop and Spring Field Review Closeout meetings.

Review of action items followed.

Structure Workshop Action Items:

2. SCREEDING ON SKEWS *(STRUCTURE DESIGN)*

Roadway Design reported that they had drafted a policy memorandum on mitigation of severe skews, but was not issued because it created conflicts with other Roadway Design policies.

Structure Design proposed a couple of different ways to show cross-sections along the bridge deck for bridges that meet the criteria for difficult screeding. The Bridge Construction Engineers preferred to review cross-sections at 10th or 20th points along the bridge deck.

The Bridge Construction Engineers suggested submitting the cross-sections along the bridge deck with the Preliminary General Drawing approximately nine months prior to letting.

3. CROSS-SONIC LOGGING (CSL) TUBES *(GEOTECHNICAL ENGINEERING)*

Geotechnical Engineering reported that they had issued a policy memorandum on detailing CSL tubes. The policy was discussed briefly, and a few revisions were suggested, such as detailing the tubes for bridge piers with no redundancy (e.g. hammerhead piers) and locations where dewatering the excavation prior to pouring concrete is required.

4. ROADWAY BRINING *(STRUCTURE DESIGN)*

Action Item(s):

- ▶▶ Mr. Drda will discuss the issue with the Operations staff.
- ▶▶ The Bridge Maintenance Unit will discuss the issue at the Maintenance Conference.
- ▶▶ Mr. Perfetti will raise the issue at a Bridge Team meeting.
- ▶▶ Structure Design Unit will develop a detail for drip beads on steel girders and consider a longer painted section at the ends of weathering steel girders.
- ▶▶ Dr. Biswas will develop an NCHRP problem statement.

Structure Design reported that they had developed a detail for drip beads on steel girders, to prevent moisture from accumulating in the vicinity of the bearings. An additional corrosion protection measure that will also be implemented is longer painted end-sections on steel bridges.

Mr. Perfetti reported that the Bridge Team has suggested including mineral admixtures on all bridge decks as a measure to increase durability. The Team has also suggested a comprehensive review of the Department's corrosion policy.

The Bridge Maintenance Unit suggested a future research project to study the effects of roadway brining.

5. LRFD IMPLEMENTATION: *(STRUCTURE DESIGN)*

Action Item(s):

- ▶▶ Bridges designed by the LRFD specifications shall be rated by LRFR.
- ▶▶ Structure Design will perform the initial LRFR bridge rating after completing the design.

The Structure Design Unit reported that most of its design software had been updated for compliance with LRFD design specifications. They also noted that the Unit will also be performing the initial LRFR rating on bridges designed in accordance with LRFD.

Structure Design will work with Geotechnical Engineering to determine the sites that require seismic design.

6. BOX BEAM PERFORMANCE: *(STRUCTURE DESIGN)*

Action Item(s):

- ▶▶ Structure Design will review the design details to determine if it is possible to improve load sharing between the box beams.

The Structure Design Unit reported that they studying they issue of improving load sharing on box beam bridges, and are considering increasing the amount of post-tensioning (PT) by detailing using 4 PT strands (2 per hole) at each diaphragm location.

The Bridge Construction Engineers suggested Structure Design place a plan note on the plans requiring Contractors to jack PT stands from both ends to ensure the correct tension is achieved, especially when the bent cap is sloped with a crown section.

7. BAT BRIDGES: *(STRUCTURE DESIGN)*

Action Item(s):

- ▶▶ Bridge Maintenance and FHWA will each send a letter to Structure Design stating their concerns.
- ▶▶ Structure Design, after receiving the letters, will draft a collective statement articulating the Department's policy on constructing bat-friendly bridges.

The Department has not drafted a formal written policy on addressing requests to build bat-friendly bridges. However, the discussion confirmed there was continued consensus that any accommodations for bats should be made off the bridge due to maintenance and health concerns.

8. MINIMIZING RAILROAD FLAGGING: *(STRUCTURE DESIGN)*

Action Item(s):

- ▶▶ Structure Design will discuss the issue with contractors at the next AGC-DOT meeting.
- ▶▶ Structure Design will investigate the use of a couple of different methods for flagging payment on a trial basis.

Structure Design reported that they are currently working with Project Services to identify suitable projects for payment of railroad flagging by alternate methods. This issue was also discussed with Contractors at the April 11, 2007 AGC-DOT Joint Bridge Design Committee meeting.

9. B-77 GRAU - RUBRAIL ATTACHMENT *(STRUCTURE DESIGN)*

Action Item(s):

- ▶▶ Structure Design will coordinate with Roadway Design to implement ¾" adhesive anchors for the rubrail.

Structure Design reported that the 3/4" adhesive anchors have been implemented and incorporated into the Unit's standard drawings.

There was also some discussion on the use of adhesive anchors, especially in overhead applications where tensile creep is likely. Structure Design reported that they have implemented a comprehensive revision of the policy on use of adhesive bolts and anchors. In addition, Materials and Tests reported that the fast set product used in the "Big Dig" project has been removed from the list of approved products.

10. USE OF BRIDGE DEMOLITION DEBRIS: *(FHWA)*

Action Item(s):

- ▶▶ FHWA, PDEA, and Project Services' Contract Office will draft a policy on how the debris will be made available.

The Department has not yet formalized a process for advertizing bridge demolition debris, but intends on setting up a web site to advertise the debris.

PDEA noted that the Department can obtain federal credits for any material that is recycled, so it was agreed that the Project Services Recycling Coordinator would be encouraged to document all recycling efforts within the Department. Also, the Alternative Delivery Unit Head will be alerted so that they too can document recycling efforts on design-build projects.

11. PILE JETTING: *(FHWA)*

Action Item(s):

- ▶▶ Geotechnical Engineering will take the lead in developing a preliminary pile jetting policy and finding a suitable trial project.

Geotechnical Engineering reported that they have reviewed the research report and are currently preparing policy guidelines on jetting.

12. ONGOING RESEARCH PROJECTS: *(RESEARCH & ANALYSIS)*

Research and Analysis reported that the draft final report on the fast clad project used on 3 bridges on US 64 was now in progress. The research has shown that the product used on these three bridges did not yield a satisfactory performance. As such, the research will not recommend further use of the fast clad paint system. However, Materials and Tests thinks that the paint system is viable and would like to see a thorough investigation into the reasons for the sub-par performance of the paint system.

13. ARMORED JOINTS ON SMITH CREEK PARKWAY: *(CONSTRUCTION)*

Action Item(s):

- ▶▶ The Construction Unit will communicate with Dr. Gergerly regarding the location of joint armor angle failures.
- ▶▶ The Construction Unit will coordinate removal of the failed angle on Smith Creek Parkway and send it the Materials and Tests Unit.

Construction reported that the failed armored joints have been replaced with unarmored joints.

In addition, they noted that the UNC-Charlotte led research on elastomeric concrete is progressing with current activities focusing on coring in-service elastomeric concrete in the Charlotte area.

14. INTEGRAL ABUTMENTS:

(MATERIALS AND TESTS)

Action Item(s):

- ▶▶ Structure Design will develop a plan note to permit placement of the reinforced approach fill prior to the deck pour for integral abutment bridges. Contractors will be required to submit their plan for constructing the approach fill and backwall formwork for review.
- ▶▶ Structure Design will revise details on Standard Drawings to show a PVC approach fill drain pipe, and the sub-base material terminating at the end of the approach slab.

Structure Design reported that their Standard drawings have been revised to show the approach slab sub-base material terminating at the end of the approach slab. Other revisions, such as the suggested Schedule 80 PVC pipe and plan note, are currently under development.

There was some discussion on approach fill details in general. The Bridge Construction Engineers noted that they experience problems with runoff draining into the excavated area behind the back wall during construction. Mr. Buchanan stated that he would send sketches showing recommended revisions to the approach fill details to Structure Design.

15. EXCESSIVE STEEL GIRDER ROTATION AT END BENTS:

(CONSTRUCTION)

Action Item(s):

- ▶▶ Structure Design will develop a policy for detailing a closure pour for long span steel girder bridges.

Structure Design reported that they have drafted a policy memorandum on detailing a closure pour on long span steel structures.

16. ACUTE CORNER CRACKING IN CORED SLAB UNITS:

(MATERIALS & TESTS)

Action Item(s):

- ▶▶ Materials and Tests Unit will investigate this issue and make a recommendation for mitigation.

Materials and Tests reported that they have investigated use of 3-point bearing pads for mitigating cracking on acute corners of cored slab units and have concluded that this type of bearing would not be effective. The next step will be drafting a chamfer detail for discussion at a PCI-DOT meeting.

17. WELDING SIP FORMS TO THE TOP FLANGE:

(MATERIALS & TESTS)

Action Item(s):

- ▶▶ Materials and Tests Unit will further investigate this issue and draft a special provision.

Materials and Tests reported that they still prefer detailing straps for supporting SIP forms in both positive and negative moment regions, in lieu of permitting welding in the positive moment regions and using straps in the negative moment regions. Structure Design noted that using straps would reduce the stiffness contribution of the SIP forms, which is now accounted for in the deflections shown in the plans. After some discussion it was agreed that Materials and Tests will continue to monitor the problems associated with welding to the top flange, and they will also encourage and enforce improved welding practices, through the welding certification program and inspection.

18. FASTENER INSPECTION CERTIFICATION:

(MATERIALS & TESTS)

Action Item(s):

- ▶▶ Materials and Tests Unit will facilitate the bolting class.

Materials and Tests reported that the bolting class is currently under development.

19. ANCHOR BOLT TIGHTENING:

(MATERIALS & TESTS)

Action Item(s):

- ▶▶ Structure Design will request that the Signing and Signals Unit correct the special provision, and ensure that the procedure is utilized.
- ▶▶ Structure Design will investigate if the special provision is applicable to structures for signals and signs.

Materials and Tests distributed a draft special provision on anchor rod nut tightening requirements for poles, which details the procedures Contractors must follow for proper fastener installation. This issue was discussed with Contractors at the August 15, 2007 AGC-DOT Joint Bridge Design Committee meeting, and the draft special provision was distributed to Contractors at the October 9, 2007 AGC-DOT meeting. The provision will be included on all projects.

20. PAINTING STRUCTURES FOR AESTHETICS:

(MATERIALS & TESTS)

Action Item(s):

- ▶▶ When there is a request to paint for aesthetics, all Units involved should coordinate with the Materials and Tests Unit early in the process so the paint is applied in the shop.
- ▶▶ Materials and Tests Unit will coordinate development of standard paints and colors.

Structure Design has informed their staff to contact Materials and Tests when towns make requests to paint appurtenances on structures. Also, there was consensus to encourage town officials to locate signature/gateway signage and aesthetic treatments off the bridges.

Spring Field Review Action Items:

21. SITE (1) B-3866 – GREENE COUNTY

Action Item(s):

- ▶▶ Structure Design will investigate ways to mitigate the cracks in the overlay by possibly changing design details.
- ▶▶ Structure Design will detail the joint seal closer to flush with the face of the barrier rail.

For mitigation of cracks, see discussion in *Item 6*.

Structure Design has revised details on Standard Drawings to show the joint seal material closer to flush with the front face of the barrier rail.

22. SITE (2) R-2539A – CRAVEN-PAMLICO COUNTY

Action Item(s):

- ▶▶ Structure Design will develop a policy for using link slabs.

Structure Design reported that they have drafted a policy memorandum for using link slabs as an alternate to continuous for live load bent diaphragms. The policy will initially target bridges constructed with AASHTO Type III girders or smaller.

23. SITE (3) B-4188 – MARTIN COUNTY

Action Item(s):

- ▶▶ Structure Design will facilitate the project documentation.

Structure Design reported that project documentation has been completed, and a paper was presented at the 2007 PCI National Bridge Conference.

24. SITE (4) B-3640 – GATES COUNTY

Action Item(s):

- ▶▶ Structure Design will review and evaluate suggestions for corrosion protection.

Structure Design has been in discussion with Bridge Maintenance on ways to protect the upper portion of the steel end bent piles from corrosion. Bridge Maintenance preferred to galvanize all end bent piles, but this would increase the cost by approximately 33%. Another suggestion was a Sonotube concrete "jacket" over the top 5 feet of the end bent piles. However, Bridge Maintenance was not in favor of the concrete jacket.

There was consensus to hold more discussions during a future comprehensive review of the corrosion policy.

25. SITE (5) R-2404A – BERTIE COUNTY

Action Item(s):

- ▶▶ For future projects, the Construction Unit will review the contract language for removal of woody vegetation.
- ▶▶ The Roadway and Hydraulics Units will consider 0.5% for the minimum grade, and vertical curves on long structures to facilitate drainage.

Roadway Design reported that they have informed their staff to consider a minimum 0.5% grade in lieu of the current 0.3% minimum. The Bridge Construction Engineers advocated for the 0.5% grade noting that 0.3% is susceptible to having low points and would develop sufficient flow velocity to move debris during weather events.

26. SITE (6) B-1303 – NORTHAMPTON COUNTY

Action Item(s):

- ▶▶ The Structure Design Unit will plan a follow-up site visit to observe the condition of the overlay.
- ▶▶ The Construction Unit will find other projects to try jacking the transverse post-tensioning strands from both ends and will provide feedback.

See discussion in *Item 6*.

27. SITE (7) B-3703 – WAKE COUNTY

Action Item(s):

- ▶▶ Construction will provide a list of cored slab bridges where all ends were fixed, for the purpose of monitoring the condition of the asphalt overlay.

Construction reported that they are currently assembling the list of bridges.

28. SITE (8) B-3652 – GUILFORD COUNTY

Action Item(s):

- ▶▶ Structure Design will discuss the importance of carefully reviewing and discussing permits with their staff.

Structure Design Project Engineers have been reminded to carefully review permits.

29. SITE (9) B-2802 – ALAMANCE COUNTY

Action Item(s):

- ▶ Structure Design will work through the Bridge Team to evaluate the feasibility for developing a policy for more routine use of isotropic decks, such as for low truck-traffic, off-system bridges.

Structure Design reported that the Bridge Team is developing the structure for a tiered approach to bridge design. Use of isotropic decks will be incorporated into the design guidelines for the sub-regional tier.

30. OTHER:

(GENERAL)

i. Pile Tonnages

Materials and Tests noted that there have been some issues in the past with the spiral welds on pipe piles. As such, they inquired if the Department should require vertical seams on the larger pipe piles. However, no one was aware of problems with spiral welds.

ii. Stainless Clad Steel

Structure Design presented a sample of stainless steel clad reinforcing bar, which the manufacturer claims has superior corrosion resistance compared to epoxy coated reinforcing steel. It was suggested that the Department consider trial use of the product under FHWA's IBRD program. However, it was pointed out that the emphasis of the IBRD program has shifted to congestion reduction and therefore it may be difficult to secure funding for the stainless clad rebar. It was agreed to hold this product for future consideration.

iii. Rhino Deck SIP Metal Forms

Structure Design presented a sample of stay-in-place (SIP) metal forms that are coated with a material that improves the forms' corrosion resistance. The manufacturer has asked the Department to consider this type of form for use in corrosive areas.

The discussion concluded that even though the product may reduce corrosion of the forms, it does not eliminate it. The potential for initiation of corrosion at the seams and connections was deemed considerable, and therefore it was decided not to try this product at this time.

iv. Bridge Policy for the Sub-Regional Tier

Mr. Perfetti stated that Structure Design will be redesigning some projects based on the sub-regional tier design criteria outlined by the Bridge Team. In addition, the Unit will be identifying projects that are suitable for standardized designs on a case-by-case basis, starting with the July 2008 letting.

v. CNI Acceptance

Mr. Koch stated that there has been some confusion on what course of action should be taken when concrete members do not meet the Department's calcium nitrite (CNI) acceptance criterion. As such, Structure Design completed a short study on the frequency of these situations. Using charts for 3 gal./yd³ of CNI in the plastic concrete, Mr. Koch showed the distribution of actual recovered CNI in lbs./yd³. The charts showed that there was a 95% probability that the recovered CNI was at least 5.1 lbs./cu. yd³. Therefore, he suggested that the Department maintain the current acceptance criterion and perhaps devise a reasonable penalty for the relatively few cases where the CNI content falls below acceptance level.