

2019 STRUCTURES WORKSHOP MINUTES

The 2019 Structures Workshop was held on March 28th in the Structures Management Unit Conference Room C in Raleigh, NC. Those in attendance included:

Brian Hanks	State Structures Engineer
Dan Muller	FHWA-Division Bridge Engineer
John Pilipchuk	State Geotechnical Engineer
Stephen Morgan	State Hydraulics Engineer
Wiley Jones	Assistant State Construction Engineer
Chris Kreider	Assistant State Geotechnical Engineer
Eric Williams	Assistant State Geotechnical Engineer
Jay Twisdale	Assistant State Hydraulics Engineer
Kevin Fischer	Assistant State Structures Engineer
Gichuru Muchane	Assistant State Structures Engineer
Brian Hunter	Materials and Tests – State Laboratory Operations Manager
Todd Whittington	Materials and Tests – State Field Operations Manager
Cameron Cochran	Regional Bridge Construction Engineer
Aaron Earwood	Regional Bridge Construction Engineer
David Candela	Area Construction Engineer
Aaron Griffith	Area Construction Engineer
Randy Hall	Area Construction Engineer
John Partin	Area Construction Engineer
Aaron Powell	Area Construction Engineer
Darin Waller	Area Construction Engineer
Dean Hardister	Geotechnical – Western Regional Operations Engineer
Scott Hidden	Geotechnical – Support Services Supervisor
Jerry Snead	Hydraulics – Engineering Supervisor
Galen Cail	Hydraulics – Engineering Supervisor
Brian Radakovic	Hydraulics – Engineer
Cabell Garbee	Materials and Tests – Manufactured Products Engineer
Aaron Dacey	Materials and Tests – Coatings Engineer
Jason Poppe	Materials and Tests – Concrete Products Engineer
David Stark	Priority Projects – Project Engineer
Laura Sutton	Project Management – Team Lead
Steven Bolyard	Research and Development – Research Engineer
Mustan Kadibhai	Research and Development – Research Engineer
William Akabi-Davis	Roadway Design – Engineering Supervisor
James Bolden	Structures Management – Project Engineer
Trey Carroll	Structures Management – Engineering Supervisor
Nick Pierce	Structures Management – Engineering Supervisor
Madonna Rorie	Structures Management – Engineering Supervisor
Bill Goodwin	Structures Management – Staff Engineer
Tim Sherrill	Structures Management – Staff Engineer

The following topics were discussed:

WELCOME

Mr. Hanks kicked off the meeting with self-introductions, welcome remarks, and a statement on the purpose of the workshop. He noted that the workshop is a unique forum where the represented disciplines discuss issues of mutual interest and serves to keep communication open between Business Units.

REVIEW OF 2018 STRUCTURES WORKSHOP MINUTES

Mr. Muchane briefly summarized topics from the 2018 Structures Workshop Minutes and progress of each topic was briefly reported as follows:

- 1) **Fly Ash in Bridge Decks** – Materials and Tests, Construction, and Structures Management will discuss possible fly ash alternatives. Some products have been identified but testing must be performed. Workgroup consisting of M&T, Construction, and SMU will be created.
- 2) **Integrals & MSE Walls** – A research project will begin this year to evaluate the performance of integral end bents.
- 3) **Pipe Liners** – Hydraulics is finalizing a special provision and guidelines for pipe liners.
- 4) **Sill and Baffle Guidance** – Hydraulics is coordinating with the City of Charlotte who has an ongoing research project.
- 5) **Scour Executive Committee** – Mr. Muller will assume Ms. McAbee’s role and coordinate restarting the Scour Executive Committee.
- 6) **Project Site NCR Process** – Materials and Tests is working on a process to connect NCRs to projects in order to track the in-service performance of the NCR repair.
- 7) **Latex Overlay Certification** – Materials and Tests is working on the certification program.
- 8) **Rebar Program** – Materials and Tests is finalizing the Concrete Reinforcement Program.
- 9) **RFID Updates** – Materials and Tests is developing a tagging process for concrete, metal, and plastic pipe.
- 10) **Shallow Foundations at MSE Walls** – Construction on the trial bridges has not started.
- 11) **Integral End Bents** – Structures Management has an upcoming research project investigating the performance of various integral end bent configurations.
- 12) **Aluminum Culverts with Concrete Headwalls** – Materials and Tests noted that it is not feasible for the fabricator to coat ends of pipes prior to shipping because they do not know which pipe will be located at a headwall.
- 13) **Vehicular Culvert Underpasses** – Structures Management is adding language to the Design Manual to consider using precast vehicular culverts for low volume roads.
- 14) **Casting Units in Advance of Contracts** – Precasters indicated that it is not feasible to cast units in advance due to no standard girder lengths.
- 15) **Integral End Bent Detail – Dowels vs. 45 Degree “S” Bars** – Construction reported no cause for the cracking was found and noted other bridges on the project with the same detail did not experience cracking issues.
- 16) **Mid/High Range Water Reducers to Increase Slump** – Materials and Tests and Construction are managing Contractor’s mix submittals case-by-case when higher slumps are indicated.
- 17) **Precast Soffits/Precast Forms** – Materials and Tests is creating a policy to address precast soffits, forms, and similar items.

- 18) **CFL Diaphragm Forming** – Structures Management is revising CFL diaphragm details to extend beyond the exterior girder.
- 19) **Deck Cracking Policy – VDOT** – Mr. Muller will coordinate a meeting between VDOT, Construction, and Structures Management.
- 20) **Cold Weather Concrete Placement** – No update reported.
- 21) **Cost of Coring if CSL fails** – No changes have been made.
- 22) **DTIs on Painted Surfaces** – Materials and Tests noted the concerns have been addressed internally.
- 23) **Use of Type K Cement** – A meeting was held with a Type K cement manufacturer and Construction is scheduling a trial project.

FHWA TOPICS

1) FHWA Updates

Mr. Muller introduced himself as the new FHWA Bridge Engineer replacing Ms. Wendy McAbee. He highlighted upcoming funding opportunities including a new Federal Bridge Replacement and Preservation Program and USDOT BUILD grant.

Action Item:

None

RESEARCH & DEVELOPMENT TOPICS

1) Research Needs Process

Mr. Kadibhai gave a presentation on the NCDOT research proposal and selection process. He discussed the process and timeline from submitting initial research need statements, to how projects are selected and funded. He also shared information about the Research and Innovation Summit held Tuesday, May 7, from 8:30 a.m. to 5:00 p.m. at North Carolina A&T University.

Action Item:

None

STRUCTURES MANAGEMENT TOPICS

1) Unit Updates

Mr. Hanks discussed Structures Management Unit's organizational chart and gave a brief description of the functions and responsibilities of the various project groups.

Action Item:

None

2) Bridge Program

Mr. Hanks presented an overview of the Bridge Program including the number of projects programmed for each fiscal year and the anticipated funding. He noted that other units will be involved in the bridge program and Structures Management will continue to keep some projects in-house in order to maintain design expertise throughout the Department.

Action Item:

None

3) BUILD Grant

Mr. Hanks discussed 77 bridge replacement projects that are part of a USDOT BUILD Grant. He stated the grant will be used to replace structures with low weight limits but are not classified as Structurally Deficient (SD) or Functionally Obsolete (FO). He noted that projects are required to be let by September 2020 with the expectation that the projects be closed out by September 2025 and he discussed the different delivery methods that will be used for letting the projects including bundling bridges for Express Design-Build. Mr. Muller stated that FHWA will provide oversight as part of the grant requirements.

Action Item:

None

4) Constructability Review – Preliminary General Drawings

Mr. Hanks inquired if Area Construction Engineers (ACEs) are being given the opportunity to review and comment on Preliminary General Drawings (PGD). Mr. Cochran and Mr. Earwood stated ACEs are not receiving PGDs for all the Division managed projects and noted that Construction is not being given an opportunity to review roadway plans during development. There was some discussion about the difficulty to modify roadway alignment, geometry, etc. once Structures is at the PGD phase. Mr. Fischer noted that during a recent Pre-Construction Workshop a similar topic was discussed and that Integrated Project Delivery (IDP) teams are working to address the issue.

Action Item:

Mr. Fischer will follow-up with the IDP Teams about having requirements to consult the Construction Unit earlier in the design process.

5) Sheet Pile Abutment Research – Next Steps

Mr. Hanks discussed a recently completed research project that investigated the use of steel sheet pile abutments and he recommended a trial project should be the next step.

Action Item:

Construction, Geotechnical, and Structures Management will find a trial project to implement the research.

6) MASH – Barrier Rails

Mr. Hanks stated that bridge rails on projects let after December 2019 will need to be MASH compliant, which involves physical crash testing. Mr. Muchane discussed the NCDOT research project to crash test the Two Bar Metal Rail and noted that NCDOT is involved with two Pooled Fund Studies investigating other rail types for MASH compliance. Mr. Hanks inquired if FHWA could provide additional information regarding other rails that have been crashed tested for MASH compliance.

Action Item:

Mr. Muller will investigate rail types that have been MASH approved and will provide a list to Structures Management.

7) Epoxy Anchors in Sustained Tension

Mr. Hanks inquired about the status of a Departmental policy for the use of epoxy anchors in tension. Mr. Earwood stated that currently the Department is reviewing their use on a case-by-case basis and noted that installers must be ACI certified. He also noted that Construction will begin training DOT inspectors on how to inspect installations. Mr. Hanks recommended developing a policy to address the use for epoxy anchors in sustained tension.

Action Item:

Construction, Materials & Tests, and Structures Management will develop policy and discuss with AGC.

8) Structure Drainage Systems

Mr. Hanks noted that regulatory agencies often require the use of closed drainage systems on bridges. He discussed the inadequacies of the current systems including installation costs and maintenance requirements. Mr. Hanks and Mr. Cochran shared an example of a gutter drainage system mounted to the side face of the deck overhang and proposed this system to replace closed drainage systems in some instances. They noted that the gutter system is easier to install and maintain.

Action Item:

Structures Management will develop details for a gutter drainage system and share with both the Hydraulics and Environmental Analysis Units.

9) Harkers Island Project

Mr. Hanks discussed the upcoming Harkers Island bridge replacement project. He noted that all structural elements on the project will utilize carbon fiber reinforced polymer (CFRP) prestressing strand and/or glass fiber reinforced polymer (GFRP) rebar, except for the barrier rail, which will use carbon steel.

Action Item:

None

HYDRAULICS TOPICS

1) Unit Updates

Mr. Morgan shared that the Hydraulics Unit has relocated to Building A at the Century Center and announced that Mr. Jay Twisdale will be retiring in May 2019.

Action Item:

None

2) Stream Bank Protection at Spill through Abutments

Mr. Cail discussed stream bank protection issues when the bridge end slopes are offset less than the typical 10 ft. from the stream bank. Mr. Earwood suggested to rip rap the entire bench area when the bank is less than 10 feet. Mr. Earwood also noted concerns with rip rap plan details for instances where the stream bank is close to the bridge end slope. He noted proper installation of the rip rap requires excavating below the end bent cap and keying-in rip rap at the toe of the fill. He inquired if the detail could be revised to address concerns with undermining the end bent cap and armoring the stream bank.

Action Item:

Structures Management will share these concerns at the next ACEC subcommittee meeting.

Hydraulics and Structures Management will discuss bridge layout in relation to stream bank protection.

3) Erosion/Stability Issues with Deck Drain Placement

Mr. Cail noted that deck drain placement can contribute to erosion issues and stated that Hydraulics is developing details to address these problems.

Action Item:

Hydraulics will continue developing details to address erosion/stability issues with deck drain placement.

4) Scour Executive Committee Updates

Topic was discussed while reviewing the 2018 Structures Workshop Minutes under the topic “Scour Executive Committee”.

Action Item:

Mr. Muller will coordinate the restarting of the Scour Executive Committee.

5) Temporary Structures/Dewatering

Mr. Morgan noted recent issues with dewatering temporary structures, group discussion concluded that good communication and coordination would address the issues. Further conversation discussed removal of existing bents and Contractor’s coordination to ensure temporary structures are in place to assist with the removal when necessary.

Action Item:

None

MATERIALS AND TESTS TOPICS

1) Unit Updates

Mr. Whittington discussed Materials and Tests Unit's organizational chart and noted that Mr. Chris Peoples has been promoted to Director of Field Support.

Action Item:

None

2) Specifications/Inspection of Misc. Metal Items on Structures

Mr. Garbee discussed examples of various ancillary metal items, such as solar array platforms, that have been fabricated and delivered to project sites without Materials and Tests (M&T) knowledge or involvement. He noted that M&T is required to approve/inspect a supplier’s material source, facility, and fabrication process for any metal item that is permanently installed on structures. He asked that Construction notify M&T when any such items are found on a project site without M&T approval documentation.

Action Item:

None

3) *Hold-Down Systems for Cored Slabs and Box Beams*

Mr. Garbee discussed common void hold-down systems for cored slabs and box beams. He noted that most precasters use a combination of both internal and external hold-downs. Mr. Poppe noted that working drawings for hold-down systems are submitted for each project, but typically don't change and stated that precasters are inquiring if a blanket approval could be issued. Mr. Hanks noted that Structures Management's plan notes allow only internal hold-down systems and will need revising to allow hybrid systems.

Action Item:

Materials and Tests and Structures Management will discuss approval process for hold-down systems.

Structures Management will revise plan notes to allow for a combination of internal and external hold-downs.

4) *Rebar Program*

Mr. Hanks inquired if other types of non-ferrous material could be included in the Materials & Tests Unit's Rebar Program. A general discussion concluded that having a variety of available materials could result in more economical pricing for the non-ferrous materials.

Action Item:

Materials and Tests and Structures Management will develop a working group to add additional materials to the Rebar Program.

GEOTECHNICAL TOPICS

1) *Unit Updates*

Mr. Pilipchuk discussed Geotechnical Unit's organizational chart.

Action Item:

None

2) *New Wall Types*

Mr. Hidden gave a presentation highlighting new wall types that are available. He discussed MSE walls reinforced with geosynthetic fabric strip reinforcement in lieu of the standard steel strips and a "T" shaped precast semi-gravity wall.

Action Item:

None

3) *In-situ Scour Testing Device*

Mr. Pilipchuk gave a presentation discussing the use of an in-situ scour testing device (ISTD) to determine scour potential for a given site. He noted FHWA is still conducting field trials of the ISTD system.

Action Item:

None

CONSTRUCTION TOPICS

1) Unit Updates

Mr. Cochran and Mr. Earwood discussed the Construction Unit's organizational chart.

Action Item:

None

2) Temporary Bridges

Mr. Earwood noted Acrow Bridge expressed interest in discussing their product including discussing approach roadway requirements. He also noted that the Department has an upcoming meeting with Mabey Bridge to discuss their temporary bridge product.

Action Item:

Mr. Earwood will coordinate a meeting between Acrow Bridge and NCDOT.

3) Cofferdams

Mr. Earwood noted inconsistencies in construction contracts for addressing payment of cofferdams/impervious dikes. He noted some contracts provide no information or guidance, while others have cofferdams/impervious dikes as incidental to an associated pay item. A general discussion concluded that payment for a cofferdam/impervious dike should be clearly stated in the plan notes when it is known that one will be necessary.

Action Item:

None

4) Existing Bent Footing Removal

Topic was thoroughly discussed in the Hydraulics topic "Temporary Structures/Dewatering".

Action Item:

None

5) Integral End Bents

Mr. Earwood restated the need for a revised detail to address thermal movement in integral bridges. Mr. Candela discussed a repair detail that was used on a recent project to address shoving of the approach roadway asphalt and noted the repair has performed well. Mr. Earwood stated that Construction is considering other retrofit details to address instances of asphalt shoving. He also discussed cracking in bridge decks in the area adjacent to the integral end bents and stated the need for guidance on how to treat cracks in these areas.

Action Item:

Construction and Structures Management will discuss integral end bent deck cracking during the discussion of VDOT's deck cracking policy.

6) Approach Slabs

Mr. Earwood noted poor performance of flexible approach pavements at the approach slab transition. He suggested a possible cause is the bevel slope is too flat and results in a thin layer of asphalt at the approach slab. He recommended increasing the slope from 45 degrees to approximately 70 degrees in order to increase the asphalt thickness.

Mr. Cochran proposed increasing the concrete cover for approach slabs and noted for future rehabilitation the concrete could be milled to create a paving notch for an asphalt overlay. Additional discussion noted the proposed future paving notch could be used to address concerns with the SMU sleeper slab detail for integral end bents.

Action Items:

Construction will select a trial project and provide a steeper bevel at the roadway end of the approach slab.

Construction will select an integral end bent trial project and construct the approach slab with increased cover and the Structures Management sleeper slab detail.

7) Expansion Joint Seals

Mr. Cochran and Mr. Earwood discussed challenges with installation of expansion joint seal glands during phased construction caused by traffic sequencing and hold-down plate locations. They inquired if hold-down plates of shorter lengths would allow for easier installation and future maintenance activities to be performed with minimal traffic impacts.

Action Item:

Construction and Structures Management will continue discussing the phasing of expansion joint seals.

8) Roadway Design Manual

Mr. Cochran stated that the Roadway Unit is revising their design manual and that Construction is requesting an opportunity to comment on the alignment section of the manual.

Action Item:

Construction will discuss alignment concerns with the Roadway Unit.

9) Header Grades

Mr. Earwood discussed challenges with screed operations when the header grade difference between the straight line grade and curved grade is +/- 1/2". He requested this guidance be added to the preliminary header elevations section of the Structures Design Manual.

Action Item:

Structures Management will update the design manual to include additional header grade guidance.

10) Mass Concrete Dimensions

Mr. Earwood noted that the Project Special Provision (PSP) for mass concrete needs to be revised to clarify the applicable minimum concrete dimensions. He stated the PSP should be modified to include structural element dimensions equal to or greater than 6 feet as originally intended.

Action Item:

Structures Management will revise PSP to provide clarification on concrete dimensions.

11) Rip-Rap and Caps

Mr. Earwood discussed the need to place slope protection geotextile fabric under end bent caps to prevent the fabric from sliding down the slope as the rip rap is placed.

Action Item:

Structures Management will revise slope protection details to include placing geotextile fabric under end bent caps.

12) Cored Slab Tolerances for Squareness

Mr. Earwood noted that the *Standard Specifications* do not provide a squareness tolerance for midspan of cored slab units and discussed a project where aligning the units was challenging due to midspan not being square. He inquired if a tolerance should be established but noted that ensuring the units align properly is the responsibility of the Contractor. It was decided not to establish a tolerance for midspan squareness.

Action Item:

Construction will notify Materials and Tests of any cored slabs that exhibit squareness concerns.

13) Latex Certification

Topic was thoroughly discussed while reviewing the 2018 Structures Workshop Minutes under the topic “*Latex Overlay Certification*”.

Action Item:

Construction will review proposed program once completed and provide comments.

14) Diamond Grinding – PPC Overlays

Mr. Earwood noted challenges with removing the “fins” that are created in PPC overlays during diamond grinding because of the material’s hardness. He noted Divisions have used motor graders and skid-steers to remove the “fins” and suggested that flush grinding/grooving the deck after diamond grinding should be considered for fin removal.

Action Item:

None

15) PPC Slurry Disposal

Mr. Earwood stated that Construction is working with the Roadside Environmental Unit to address disposal concerns associated with PPC slurry.

Action Item:

Construction will address disposal of PPC slurry.

16) Concrete Pile Pay Item

Mr. Earwood stated that payment for piles only includes the length of pile installed and does not pay for pile cut-off lengths. If pile quantities underrun the Contractor could have a significant amount of pile cut-offs. He noted that for steel piles Contractors can reuse the pile cut-offs but for concrete piles the cut-offs are discarded. He inquired if a pay item specific to concrete piles should be created to reduce Contractor risk.

Action Item:

Construction and Geotechnical will discuss payment for concrete piles.

17) Partial Demolition over Concrete Girders

Mr. Cochran discussed concerns with damaging concrete girders when plans detail longitudinal joint locations for removing the existing structure over girders and suggested demolition should not take place over girders.

Action Item:

Structures Management will continue to monitor staged construction details.

18) Curbing for Sub-Regional Approach Slabs

Mr. Waller noted that for 12 feet approach slabs at Type III guardrail anchor units (GRAU) the 8” by 4” lip curb should run the full length of the approach slab in accordance with the Roadway Standard Drawings. Current SMU approach slab details show the end of the curb tapering when no shoulder berm gutter is present.

Action Item:

Structures Management will revise approach slab standards.

19) Closure Pour Widths/Girder Spacing

Mr. Earwood discussed current staged construction policy including girder spacing and closure pour widths. He noted the policy was developed with the assistance of the AGC Bridge Subcommittee but wondered if there was potential for additional efficiencies. The pros and cons of various girder spacings were discussed. Mr. Cochran noted that properly finishing closure pours in excess of 8 feet is a concern.

Action Item:

Construction and Structures Management will review staged construction policy.

20) Haunch Width for Moment Slab

Mr. Cochran discussed challenges Contractors encounter when setting the screed rail for approach slabs adjacent to moment slabs above MSE walls. He noted that if the 3-inch dimension from the gutterline edge of the coping were increased, the Contractor would have the option to place cups on the moment slab and set the screed rail.

Action Item:

Structures Management will revise moment slab details per Mr. Cochran’s comments.

SPRING FIELD REVIEW ITINERARY

Following the workshop, Structures Management and Construction discussed candidate bridge sites and routes for the Spring Field Review which will be located in the central part of the State. Structures Management and Construction will continue to discuss bridge sites and routes to finalize the trip, which is scheduled for April 23rd – April 25th.