# Georgia/Carolinas PCEF Committee Meeting #21

SCDOT, Hilton Hotel, Columbia, SC

**August 16, 2018**

# MINUTES

## 1. Welcome & Introductions

At 10:00 AM, Committee co-chair Reid Castrodale began the meeting by welcoming those present and attending remotely via GoToMeeting. Co-chair Romeo Garcia was participating remotely for this meeting. Self-introductions were made by attendees present and those joining remotely. A sign in sheet was circulated. (Attendee list is attached. Drs. Ziehl and Ross were present for a short time in early afternoon.)

## 2. Review & Approval of Minutes – February 8, 2018 Meeting at GDOT

A motion was made and seconded to approve the minutes as distributed. Passed.

## 3. Review of Agenda

The agenda for the meeting was reviewed. A few new items that appear on the agenda were noted.

The meeting agenda, minutes, presentations and other documents will be posted on the G/C PCEF webpage on the G/C PCI website at: http://www.gcpci.org/index.cfm/technical/pcef.

## 4. Informational – Updates from FHWA, SCDOT, GDOT, NCDOT, PCI & G/C PCI

Each agency and organization attending gave an update:

**SCDOT** – Terry Koon reported that there were two major upcoming design/build projects: Carolina Crossroads on I-26, for which the RFP is scheduled to go out in December; and a major widening project on I-26 from Carolina Crossroads up to I-85. The Department is also looking at the I-526 corridor.

Funds have been set aside to revise the Bridge Design Manual. The work will be outsourced to a consultant. They are also looking at updating their seismic design specifications and will be assisting the geotechnical unit in writing a retaining wall manual.

Within the last 6 to 9 months, his office has released their low volume bridge criteria. The bridges will be limited to CIP flat slabs or cored slabs – crossings requiring girders will not qualify for the low volume criteria. The criteria will apply for bridges with an ADT of no more than 750. The criteria are posted on the SCDOT website, but no projects have been designed using it yet.

William Nickas asked if any information was available on the Wando River Bridge where a tendon had failed. Terry reported that he had not received any information on the situation but did know that there was no corrosion where the tendon failed.

**GDOT** – Bill DuVall reported that their bridge program in FY 2018 had $277M for bridge replacements and $42M for bridge rehabilitation projects. Their program continues to grow but is still constrained by funding. They expect to be putting out about the same amount of work for the next several years. The managed lanes on the Northwest Corridor are expected to open in September. Recently, precast concrete fascia panels on a soil-nail retaining wall have failed.

They have eleven “mega projects” beginning under their Major Mobility Infrastructure Program, including widening of I-285. The I-16/I-95 project in Savannah is also underway. The I-16/I-75 project in Macon is a project with several phases that is now underway. It is the last major design/bid/build project for the Department. They are working toward replacing the I-20 bridge over the Savannah River as a design/build under an agreement with SCDOT. Teams have been short-listed, so it should be let in a few months.

He has been very focused on their local bridge program in collaboration with local governments. Last year he sent out letters on 70 bridges, got feedback on 50, and will be moving ahead with 30+ bridges. They will be sending out more letters very soon to give local governments the opportunity to participate in this program. Design of the bridges may be bundled to consultants, but some bridges will also be kept in-house for design. They may also bundle bridges for construction, if appropriate. They have a website for the local bridge programs: http://www.dot.ga.gov/IS/BridgePrograms/LocalBridges

He mentioned the fast construction of the Courtland Street replacement that is passing through the Georgia State University campus in downtown Atlanta. It is essentially conventional construction done quickly. The street was closed on May 1 and is scheduled to be opened by Nov. 1.

GDOT is considering ABC for projects; they are looking to accelerate delivery but not necessarily replace a bridge in a weekend. They are encouraging consultants to begin looking for such opportunities for ABC. There are two projects on rural roads in Henry County, south of Atlanta, that are examples of ABC construction: 1) project will use precast deck panels with UHPC closures; and 2) project will use decked girders, where the deck is cast on the girders by the contractor at the site prior to erection with UHPC closure pours between girders. These projects bid tomorrow (Aug. 17). They are using an A+B bid, where A is the bid price and B is the total time of construction. The contracts for these projects also include limits on length of road closures (45 and 60 days, respectively) and have liquidated damages if the length of closure is exceeded. Bill likes this form of A+B bidding in order to keep construction moving at a site.

Bill mentioned the Northside Drive project in Atlanta that is using precast deck panels on steel girders. This project has a number of complexities and should be let in the next few months.

The Department has included provisions allowing use of Florida I-Beams (FIBs) in contracts for two recent design/build projects which set bounds on girder span lengths. They expect the provisions will be moved into their Structures Manual to be part of their toolkit moving forward. They hope to hire a policy engineer who will be tasked with making such revisions to their manual.

Hongfen Li asked Bill if they have constructed any precast deck projects. Bill responded that their first project was completed by July 2016 and was very successful. It was a design-bid-build project. William Nickas stated that PCI should be making available several publications in the next few months that will give information on precast deck panels with the recommendation that panels larger than about 8 x 30 ft should be pretensioned to prevent cracking during handling. Bill DuVall indicated that their panels were about 9 x 20 ft and were not pretensioned, but had performed very well. He also pointed out that they like the panels because the bottom of the deck is visible, rather than being hidden by steel stay-in-place forms which is normal practice for conventional decks.

Steve Gaston added a final comment for the GDOT report saying that their plans for several recent bulb-tee projects have included girder detail sheets for both 6 and 7 in. webs. The projects were located across the state. The winning bidders had all used girders with the 6 in. web. William Nickas asked the prestressers whether GDOT needed to continue providing the two detail sheets. Richard Potts responded that he could not see much benefit in using the 7 in. web design, and that they may have more strands, but they may also have reduced compressive strength requirements at transfer. It was also recognized that Forterra prefers to manufacture bulb-tees with an 8 in. web because it is easier to place the concrete and get good compaction.

**NCDOT** – Gichuru Muchane described the general organization of the department related to bridge design. They now have more of a decentralized organization with the following responsibilities: the Project Management Unit will handle the larger bridge projects; the Structure Management Unit (SMU) will handle bridges on primary routes; and the Divisions will handle projects on secondary routes. This info is on the Department's website.

In 2019, 160 bridge projects were let by Divisions, 45 by the SMU, and there were 40 bridge preservation projects, for a total of about 250 bridge projects. In 2020, it is expected that 120 bridge projects will be let by Divisions, 50 by the SMU, and there will be 25 bridge preservation projects, for a total of about 200 bridge projects. They have a 5-year bridge program, but the funding is $10 B for 10 years.

Trey Carroll reported the Harkers Island Bridge is being designed in-house using glass fiber reinforcing bars for mild reinforcement and carbon fiber strands for prestressing girders and 24-in.-square PS piles to eliminate corrosion. The bridge is 3200 ft long with 28 spans and will use 54 in., 72 in., and 78 in. FIBs. The deck will be lightweight concrete. The tentative letting date is June 2019.

William Nickas asked about the design of the girders. Trey indicated that they were moving ahead, and that he thought that service load was still governing design. William mentioned that the carbon fiber strand was specified for a project recently let in Michigan and that the prestressers were very surprised at the high cost of the strand. He pointed out that stainless steel strand is being considered as an alternate and that FDOT is doing some work on stainless steel strand for flexural members that should be completed in the next several months. William noted that the quantity of strand required for this project will be substantially larger than any other similar project done to date, so the cost of the carbon fiber strands will be significant. He also asked if the Department could share the preliminary design with prestressers to give them an idea of the quantities that would be involved. Gichuru pointed out that the Department is seeking about $1M in funding from FHWA for the project which would be directed toward the use of the non-metallic reinforcement, so they may move ahead with it even though the economics of the material may not be competitive with other materials. Trey reported that they had completed some research at NCSU using carbon strand and this project is the next step. There will not be any research effort associated with this project other than general monitoring of performance.

**PCI & G/C PCI** –William Nickas reported that PCI just launched 7 eLearning modules that can be found on the PCI Website, which were partially funded by FHWA. The topics addressed include: 3 on preliminary engineering, materials, and fundamental layout, and 4 sessions on full-depth precast concrete deck slabs with transverse pretensioning and longitudinal post-tensioning. PCI's eLearning Center can be found at the following link: http://elearning.pci.org. Users do not have to be PCI members to use the eLearning Center but must register before using the system. Modules that are in the final stages of review include flexure, ultimate limit state, and extending spans (which includes FIBs). William recognized Prof. Michelle Roddenberry at FSU who has done a great job developing these modules. He also noted that the contract with FHWA ends in June 2019, at which time all courses should be available. A meeting is scheduled for T-10 to review the syllabus for the geometry manual and extending span ranges using curved tub girders, which have been enjoying wider use recently. There will be 4 hours of instructor-led training for each of these topics. Curved girders have now been proposed in five states: CO, WA, FL, CA & TX (the concrete design was not successful in TX). These modules are expected to be delivered at the PCI National Bridge Conference in Fall 2019.

William explained how the National Bridge Conference used to be in the fall but moved to the winter when the PCI Convention was held in conjunction with The Precast Show. However, the number of papers received has fallen off significantly, so the NBC is being moved back to the fall meeting in Chicago for 2019. Call for papers will come out soon for the 2019 bridge conference. He pointed out that there will not be a National Bridge Conference in the winter of 2019 in conjunction with The Precast Show. This will require a reassessment of which meeting the DOTs would like to attend. There will still be committee meetings, some education sessions, and the trade show at the PCI Convention in the winter. The big focus for the trade show is on workforce development, which may be of interest to some DOTs. G/C PCI wants to continue sponsoring DOTs and students and professor to the convention – last year they sponsored a total of 62.

Projects can still be submitted for the PCI Design Awards for another week or so.

Peter Finsen reported that PCI is implementing a new strategic plan that will affect several things, including support for attending the PCI National Bridge Conference. The issues will be worked out. A major focus of the new plan is that PCI will become a design code-writing provider. William noted that for the first time ever, at the recent AASHTO Committee on Bridges and Structures meeting, a PCI document was adopted by reference in the AASHTO LRFD Specifications. The next step is expected to be developing a uniform design methodology for prestressed concrete piles, which may be adopted by AASHTO later, similar to AASHTO's adoption by reference of the ACI anchorage design provisions in ACI 318. PCI has hired a new engineer who will be working full-time on code development.

Finally, William shared that he has been examining data from the National Bridge Inventory. His preliminary findings, which have not yet been made public, are that the use of prestressed concrete has increased markedly in the Georgia/Carolinas region from 55% in 1980 to 79% in 2009, or a nearly 25% change. He compared it to the VA to PA region where the use of PS during the same period has increased, but only 10%. William congratulated the efforts of the regional organization, universities, and others in seeing this improvement and noted that other parts of the country should take notice.

**FHWA** – Romeo Garcia gave a brief FHWA update at the end of the meeting. FHWA is currently updating their Bridge Construction Inspection Course, with expected completion by late 2019 or early 2020; the Bridge Bundling Guidebook should be available in September; and they are considering developing a guide for design, fabrication, and installation

of partial depth precast concrete deck panels, a system which is underutilized in most states so there is an opportunity to increase utilization. The system is used for 80 to 90% of decks in Texas and some other states.

## 5. Materials, Fabrication and Construction

5.a Accelerated Construction ..... *Informational Item*

*Lead: Bener Amado ..... William Nickas, Reid Castrodale*

Steve Nanney mentioned that the SCDOT deck girder project is scheduled to be let in December. This project has IBRD funding and has encountered delays in completion of the plans. Reid Castrodale indicated that the large vertical curve middle ordinate is causing problems. William Nickas suggested that a paper presented by Bijan Khaleghi with WSDOT at a National Bridge Conference be shared that describes projects for which girders have been precambered.

Richard Potts mentioned that the Ft Pulaski Bridge near Savannah, GA, was being constructed with many precast elements to speed construction. The bridge has used prestressed girders, prestressed concrete stay-in-place forms, precast pile caps, and precast wingwalls.

***Action item(s) completed:***

***New action item(s):***

5.b Reciprocity for Certifications and Other Issues ..... *Active Item*

*Lead: JR Parimuha ..... Aly Hussein*

There has been no activity related to this item. JR Parimuha agreed to continue to lead this item. Bobby Rochester with Smith Columbia asked about the topics being considered for this item. He agreed to work with JR to revisit the item to identify any specific topics that need to be considered.

***Action item(s) completed:***

***New action item(s):***

5.c Tolerances ..... *Active Item*

*Lead: .....*

William Nickas commented on the NCHRP Web-Only Document 243: *Recommended Guidelines for Prefabricated Bridge Elements and Systems Tolerances and Recommended Guidelines for Dynamic Effects for Bridge Systems* that was published in late 2017. It has a systematic procedure for looking at the accumulation of tolerances that should be noted. The link for the report is:

http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_w243.pdf

***Action item(s) completed:***

***New action item(s):***

5.d Silica Requirements and Rubbing Girders ..... *Active Item*

*Lead: Jeff White .....*

Jon Smith indicated that GDOT initiated a new policy in April after the EPA silica requirement was implemented: that only requires dry rubbing of exterior faces of fascia girders – other faces are only wet-rubbed and the surface is left as is. Mike Garner is satisfied with the results, since all bugholes are being filled. The revised procedure is currently being implemented and assessed. If successful, it will be added into the SOP.

*The new sack rub policy states:*

- *Mix same type cement/sand mixture with water as directed in the DOT Type I/II rub mixture ratio.*
- *Apply mixture to entire exposed area of the girders.*
- *Allow material to dry accordingly and ONLY rub off latent material on the exterior face of the exterior girders. Interior faces will be left in the wet rub dried state as they will not be visible by the traveling public.*

Jason Poppe reported that NCDOT was looking at these procedures and is still working on it. Cabell Garbee was looking to get some photos to use for training new inspectors to get uniformity in application of these standards. The draft SOP for NCDOT is expected to be completed in September.

Jon Smith asked how contractors in the field are addressing this issue, and whether they are using old procedures, or are adopting something similar to what has been discussed for girders. William Nickas told the group that field construction is a different situation because forms are typically wood and may have to be finished more aggressively to obtain the desired look. Also, OSHA has different requirements for field construction and in-plant fabrication because exposure in the field may be less consistent than it is in a typical plant. Requirements vary widely between DOTs.

It was agreed to drop this from the agenda for future PCEF meetings, but to continue to discuss during meetings with each DOT.

***Action item(s) completed:***

***New action item(s):***

5.e SCC Requirements ..... *Active Item*

*Lead:*

In response to a request at the last meeting, the comparison of the SCC specifications for the three DOTs that was prepared by Jeff Carroll, GDOT back in 2011 has been posted on the G/C PCEF webpage on the G/C PCI website [***Action Item Completed***]. This is being brought up to ask the DOTs to update the comparison if there have been any changes. Peter Finsen has also obtained an Excel version from Jeff Carroll if DOTs would like to use that rather than the PDF that is posted on the G/C PCEF webpage.

SCC experience in the states was discussed. William Nickas indicated that producers want options, and SCC is a useful option for plants. SCDOT reported that they see SCC in precast plants, but not prestress plants. NCDOT is seeing some plants using high slump mixes (9 to 10 in.), but they are not seeing true SCC mixes. NCDOT's requirement that internal vibration cannot be used for SCC has been a deterrent to its use because prestressers feel that some vibration is needed even for SCC. Jon Smith noted that the SCC mix developed by Larry Kahn from Georgia Tech had worked very well. Jeff White reported that his plant had tried SCC several years ago hoping that it would provide a finish that would require much less work. However, they found that the finish was even worse than the usual finish and that some vibration would be required, but the NCDOT specification would not allow it.

Richard Potts reported that the Standard Concrete Products plant in Tampa is using SCC exclusively. The Savannah plant is getting a new batch plant that should be operational soon, and it will be capable of making SCC. It is difficult for a producer to switch back and forth between SCC, because it is better to keep production simple (only 1 type of mix) for plant personnel, and its use will affect the staffing requirements at a plant. Bill DuVall asked Richard if their contracts were to include the SCC specification as an option, would they be interested in using it. Richard responded that they would consider using SCC.

Aly Hussein asked about the difference in price for SCC. Producers responded that concrete would be more, but that the girder price may be reduced if other efficiencies were realized. William Nickas mentioned that SCC may not work with concrete delivery vehicles used in some plants, so that is also a consideration.

Jon Smith mentioned that he had heard from an admixture representative (Paul Ramsburg with Sika) that PCI had a definition of spread for SCC that could be used to differentiate between SCC and flowable concrete. William Nickas said that we should check with Kyle Riding, the chair of the PCI Concrete Materials Technology (CMT) Committee who is now at the University of FL in Gainesville. William suggested that Kyle might be able to give an update at the next meeting. (It was later found that Prof. Mi Chorzepa from UGA is Vice Chair of the CMT committee, so should also be able to give an update. [After the meeting, it was learned from Paul Ramsburg that PCI does not have a definition of SCC, but uses definitions from ACI and ASTM [***Action Item Completed***]]

***Action item(s) completed:***

- *Send previous G/C PCEF SCC comparison to DOTs for updating* — *G/C PCI*
- *Contact PCI Concrete Material Technology Committee regarding SCC definition* — *Reid Castrodale*

***New action item(s):***

- *Update comparison of SCC specification requirements* — *DOTs*
- *Contact PCI Concrete Material Technology Committee regarding SCC definition* — *Reid Castrodale*

5.f Electronic Submittals ..... *Active Item*

*Lead: Jeff White*

This item was added to the agenda because it had been discussed in individual DOT meetings. It was thought that there may be a benefit for DOTs to hear experiences from other DOTs.

Bill DuVall reported that GDOT is planning to use ProjectWise for upcoming projects. The Henry County project contract requires its use because of the short project turnaround time. It was also reported that NCDOT plans to transition to using ProjectWise.

Jeff White said that precasters do not directly use the system, because they email their submittals to the contractor who then uses the system to make the submittal to the DOT. But the contractors must be submitting the package electronically, because they are being returned electronically. William Nickas asked if any information was being lost in the exchange of documents. Jeff indicated that for NCDOT, any comments on the submittal are listed on the cover letter as well as in the documents. Submittals being returned from SCDOT are very similar. Richard Potts indicated that their experience was similar.

William Nickas indicated that there was a long discussion about BrIM at the AASHTO Bridge Engineers' meeting. He thinks there is going to be a big push to make this happen for bridges. FHWA is supporting the effort.

Hongfen Lin indicated that using fully electronic submittals is best because they find that documents often become unreadable when scanned. Richard recommended that she contact the prestressers if she ever receives one of their submittals that cannot be read. Steve Nanney indicated that most designers are accepting electronic submittals even though that is not in strict compliance with SCDOT contract documents. SCDOT is currently developing a policy for electronic submittals. A draft has been developed and circulated. They may be using BlueBeam for marking up files.

***Action item(s) completed:***

***New action item(s):***

***Break for Lunch***

***Presentation by Tim Sylvester, CEO and Chief Technology Officer with Integrated Roadways.***

Tim gave a presentation remotely on precast pavements and the concept of integrating technology and communications systems into the pavement sections. The initial intent is to target high traffic corridors, improve traffic engineering and to enable realization of the full potential of "smart" cars and provide a viable model for financing the needed replacement of the highway system. A demonstration project is being constructed in Denver, CO. It should be installed and turned on by the end of August, with a showcase by the middle of September. The presentation has been uploaded on the G/C PCEF webpage.

## 6. Parameters and Standardization

6.a Precast Pavements [approach slabs] ..... *Informational Item*

*Lead: Brian Hanks*

FHWA had recently presented a workshop on precast slabs to SCDOT which was interested in exploring the possibility of using the technology. However, Chad Hawkins indicated that after further study, the Department found that they could not make the life-cycle costs of the project work out to make precast pavement feasible.

William Nickas indicated that PCI is in the final stages of balloting a document on prestressed concrete pavement design methodology – delivery is probably three months away. It will be the sixth document in PCI's series on precast prestressed concrete pavements. Previous documents haven't provided all of the tools needed to convert a CIP pavement to a prestressed concrete pavement, but this document will.

The action item on approach slab details was discussed. It was agreed that details will not be developed by industry due to limited experience and volume for these products, so the item will be removed from the action item list. However, William Nickas indicated that TxDOT has standards that are being used and he will share those details. The item will remain on the agenda for sharing of this information.

***Action item(s) completed:***

***New action item(s):***

- *Share TxDOT details for precast approach slabs* — *William Nickas*

6.b Full-Depth Bridge Slabs ..... *Informational Item*

*Lead: Brian Hanks ..... Bill DuVall*

Bill DuVall reported that he had sent the presentation on a GDOT full-depth deck slab project to Peter Finsen for posting on the G/C PCEF webpage [***Action Item Completed***].

The action item to invite Eddie He to give a presentation on his AccelBridge system had been carried, because several projects had not been completed. Eddie gave a presentation to the committee in 2012, (posted on the website). It was agreed to remove this item; a presentation can be made later if there is renewed interest.

Bill DuVall asked about PCI documents available on precast full-depth deck panels. William Nickas reported that the document had been developed and distributed to each DOT through support by FHWA and is now available on the PCI website at no charge. PCI has also developed and made available 4 hours of web-based training on full-depth deck panels through a cooperative agreement with FHWA. The training includes design examples and was launched a few weeks ago. These modules, as well as others William had discussed earlier in the meeting, are available at no charge on the PCI eLearning website as continuing education for engineers (PDHs can be obtained after completing the test at the end of each module) or for use in university classes. These courses are in the T-series of classes on the eLearning site: http://elearning.pci.org. The following information was received after the meeting regarding use of the PCI eLearning website:

> *Users do not have to be a PCI member to use the eLearning Center but are required to register before using the system. There is a "Register here!" button beneath the login fields. Once registered or logged into the system, all available courses can be selected and added to "My Courses." (My PCI Courses will be the section that contains all courses a user has selected or completed.) A quick PDF guide for navigating the content of a given course is available. [This PDF will be uploaded to the PCEF webpage]*

To address an earlier question from Bill DuVall regarding how to determine when a deck panel needs to be prestressed to prevent cracking during handing, William Nickas agreed to share calculations prepared by Roger Becker that address the issue. The calculations address a panel with holes, such as holes for shear studs that create a weak plane in a panel. Their conclusions agree with work by Utah DOT indicating that panels larger than 10 x 30 ft needed to be pretensioned. William gave a presentation on this topic to the AASHTO bridge engineers' meeting in VT earlier in the summer.

***Action item(s) completed:***

- *Obtain copy of presentation on full depth deck slab project* — *Bill DuVall*

***New action item(s):***

- *Share calculations regarding critical panel size requiring prestress* — *William Nickas*

6.c Process Standardization ..... *Various*

*Lead: Jeff White*

The following issues were discussed.

*6.c.1 RFID/Bar codes for precast products.....Informational Item*

Cabell Garbee reported that the system is working well for NCDOT, and that they are ready to expand implementation to other products such as cast iron products, signs, and different types of pipe. Their IT group is working on a new interface that allows sharing of data in both directions, showing users what has been received.

Bobby Rochester asked if there was any control on the price of tags, since they were only available from a single source. Cabell indicated that Idencia has a patent for tags that can be read visually, with an optical scanner, and with an RFID scanner, and the tags are expected to be functional for 50 years; the Department wants all of these characteristics for both construction and asset management. Therefore, he expects it will be difficult for another supplier to produce the tags. He hopes that the cost of the tags will come down since many other DOTs are very interested in the technology.

Chad Hawkins reported that SCDOT is interested in the system. However, they do not have the staff to implement the system at this time, so its use will not be required any time soon. They may purchase a reader if suppliers are using the tags.

William Nickas mentioned that several vendors have systems that use short-term paper tags that are being used to track products through a plant and to the job site. However, they are not intended for long-term use.

Prestressers expressed concern about the price of the system and the potential that different states may require different systems. Peter Finsen pointed out that since the system is specified by NCDOT, all competitors have to use the same system and will experience the same costs. He also mentioned that the reason the topic is being discussed in this meeting is to allow SCDOT and GDOT to understand the system and to consider standardizing its use for their departments as well, so multiple systems won't be used in the region.

Cabell indicated that the scanner technology has improved greatly so they are now scanning with an attachment to a cell phone rather than having to purchase a tablet for scanning; the phones are also working better. He said that he "sold" the idea of implementing the RFID data handling system to NCDOT management because they can save a lot of time in completing forms and in chasing down errors because of bad penmanship in hand-written reports that had been used previously. They also are looking forward to using the system for asset management, so inspectors will have easy access to all data associated with the materials used in a bridge.

Richard Potts indicated that their three plants are now using RFID tags to track their product within the plant.

***Action item(s) completed:***

***New action item(s):***

*6.c.2 Full-Length Debonding of Strands.....Active Item*

Reid Castrodale showed the notes from the NCDOT Cored Slab Standards which indicate the optional use of full-length debonded strands so a producer can cast cored slabs with different strand patterns in bed at the same time [***Action Item Completed***]. This greatly improves efficiency in bed utilization and reduces wasted strands and product cost. A copy of the slides with the notes is posted on the PCEF webpage.

JR Parimuha indicated that this policy allows him to mix different lengths of cored slabs, and even slabs from different jobs, in the same bed. Fully debonded strands have also been used in other types of sections, including girders, although NCDOT does not have a written policy addressing this. It was noted that fully debonded strands are not considered when addressing debonding limits in the AASHTO LRFD Specifications because those requirements address only fully bonded or partially debonded strands.

Prestressers agreed it would be helpful to have a written policy on using full-length debonded strands for products other than cored slabs so that bids could be prepared knowing that girders with different patterns could be cast in the bed at the same time. Otherwise, uncertainty would lead prestressers to bid projects in a less

efficient manner that would increase project costs. A written policy will also reduce risk for consultants that are reviewing shop drawings but are not certain if and when full-length debonding should be permitted.

After prestress transfer is completed, full-length debonded strands are typically left in place. A recess should be provided at girder ends to allow sealing the ends of the fully debonded strands as is done for other debonded strands. There is no reason to remove the fully debonded strands; successful grouting of the hole if a full-length debonded strand were removed may be difficult. It may also be difficult to remove a full-length debonded strand.

Hongfen Lin reported that SCDOT recently approved using two full-length debonded strands in a bulb-tee girder. They do not have a written policy. She suggested that designers need to be educated that they should try to keep the same strand pattern as much as possible. This would be a good topic for discussion in a prestressed girder design seminar.

Jeff White recounted a project from a number of years ago with 4 girders where each had 2 less strands than the next girder. While preparing his bid, he called NCDOT and asked if they could put all girders in the same pour by using full-length debonding, but NCDOT was unable to respond because the project was out for bid. So the bid was prepared with a single girder in each pour (in a 300 ft long bed), wasting a considerable amount of strand. After he got the project, he NCDOT allowed use of full-length debonding so all 4 girders could be cast in the same pour, with the maximum of 6 full-length debonded strands in a girder.

William Nickas related an example of the results of when another DOT did not allow full-length debonding for a project. The prestresser set up the bed with the most strands and cast and cured the first girder. The next day, the unneeded strands were cut and removed from the bed; and the next girder was cast and cured. The following day, additional unneeded strands were cut and removed, and the final girder was cast and cured. The next day, the strands were released, and all three girders were removed from the bed. While this approach saved strands and some time, it was less efficient than allowing full-length debonding. Furthermore, the girder that sat in the bed longer than the others did not get the camber that was expected, which caused concern.

Brandon Ross, who was on the team for the NCHRP project that developed new debonding requirements, recommended that debonding for I-girders should begin on the outside of the pattern and come inward, and that any strands directly below the web should remain bonded. Also, the outermost strands in each row should remain bonded.

William Nickas recommended that the DOTs consider adding text similar to what appears on the NCDOT cored slab standards to their bridge design manuals to allow designers to understand that they should design for the potential of full-length debonded strands and that full-length debonded strands should be allowed (within possible limits) on shop drawings. This could allow cost savings for the Departments, as in the example shared by Jeff White. William suggested that some text be developed as a starting point for DOTs to consider for their manuals that would allow for different debonding requirements, as mentioned below. The text should also clearly state that fully debonded strands are not considered in the partially debonded strand limits of the AASHTO specifications or DOT requirements.

Discussion then moved to the SCDOT debonding policy which is more restrictive than other DOTs, as it does not allow any exterior strands to be debonded, which is taken to include all strands in the bottom row. This results in an increased use of draped strand designs for SCDOT projects because their debonding limits often do not allow enough strands to be debonded to address concrete stress limits at transfer. Steve Nanney was not sure of the reason for requiring all strands in the bottom row to be bonded, but he thought it might be an interpretation of “no external strands”. He thought there was a design memo in the 1990s that stated this requirement, and it was carried into their design manual. Steve Nanney pointed out that since SCDOT is planning to update their bridge design manual, this would be a good time for industry to develop a list of issues they would like to have considered for the new manual.

***Action item(s) completed:***

***New action item(s):***

- *Develop proposed text on full-length debonding for DOT BDMs* *Industry*

6.d Reinforcement Details ..... *Active Item*

*Lead: Richard Potts* ..... *Reid Castrodale*

*Stirrup Projections*

Richard Potts will solicit details used by prestressers for varying stirrup projections. A recommendation should be developed for the minimum reasonable increments for varying stirrup projection considering the core dimension of the deck (distance between top and bottom layers of deck steel). A recommendation on bar marks should also be included to avoid confusion between bars for different spans. Two options will be considered for stirrups configurations: 1) bottom leg stays at the same location and length of bar varies to vary the projection, and 2) bottom leg moves up as done in the Standard Concrete Products plants.

*Continuity Bar Details*

Richard Potts reported that fabricators prefer the NCDOT continuity reinforcement detail that uses straight No. 5 bars that are bent up after girders are fabricated. GDOT does not use a continuity detail, so this detail only needs to be discussed further with SCDOT. Item can be removed from the agenda for future meetings [***Action Item Completed***].

***Action item(s) completed:***

- *Develop industry recommended standard practices for continuity reinforcement* *Richard Potts*

***New action item(s):***

*Top Strand Debonding*

The proposed revision for lateral stability, which included provisions for top strand debonding, was approved at the AASHTO Bridge Engineers' meeting in Vermont earlier in the summer. A copy of the final version of the revision has been posted on the G/C PCEF webpage [***Action Item Completed***].

The revision addresses temporary top strands that are typically detensioned in the field. The use of top strands can add complexity for fabrication because some facilities are not equipped to provide fully tensioned strands at the top of a girder. Therefore, some plants may have to use post-tensioning procedures to stress temporary top strands.

Bill DuVall related a situation on a design/build project where temporary top strands were added at the shop drawing phase. The Department was not comfortable with the concept but did allow it. He asked what issues needed to be considered when using temporary top strands. William Nickas and others responded with two basic concerns about temporary top strands: 1) detensioning the strands, which is usually performed in the field and must follow standard strand detensioning procedures (not cut); and 2) preventing water from entering strands through detensioning access ports since it could potentially freeze and cause cracking in the top flange. Notes should appear on shop drawings and the contractor should be made aware of the proper procedures for detensioning strands.

Bill DuVall reported that the project ended up with concerns about negative girder camber, because the girders did not achieve the expected camber after detensioning the temporary top strands. The girders did end up with a negative camber and the contractor had to check that vertical clearance requirements were still met (and they were). If they had not been met, the contractor would have had to propose corrective actions. GDOT does not have a policy regarding negative camber, although their preference is to avoid it.

While prestressers typically do not send employees out to the field to detension strands, Richard Potts suggested that the contractor should send one or more staff to the girder supplier's plant for training in the proper method for detensioning temporary top strands. That would be the best approach; another option would be to provide a video for training.

***Action item(s) completed:***

- *Distribute the agenda item to the DOTs* *Reid Castrodale*

***New action item(s):***

*Supplementary Stirrup Bars*

William Nickas recalled having heard from Dr. Sami Rizkalla at NCSU that the legs of supplementary bars must be developed. He agreed to look into it further.

***Action item(s) completed:***

***New action item(s):***

6.e Girder Shapes ..... *Active*

*Lead: Reid Castrodale* ..... *Gary Shrieves*

William Nickas reported on an elaborate study performed by Illinois to evaluate use of their new sections. They decided to trim the wide top flanges to provide a thicker flange tip that could better withstand deck removal operations that are common in that area. They are able to get the small 36-in.-deep girders to span 105 ft, which is competing with steel girders. They also have blocked out the bottom flange for some sections because they could not use all of the strand locations. There was an article on this in the Fall issue of *ASPIRE* magazine. The link to the article is: http://www.aspiremagazinebyengineers.com/i/575053-fall-2015/29

Activity in the DOTs related to FIBs were discussed earlier, but discussions continued here. GDOT indicated that they are retaining the FDOT details of using an odd number of strands in the bottom flange and only using debonding for controlling concrete stresses at transfer for FIB girders. William Nickas reported that LA DOTD is using FIBs with the strand pattern shifted to allow 2 columns of draped strands, while MS DOT is using FDOT's details. NCDOT has been using the FIBs with an even number of strands in the rows, but Jeff White reported that the design/build projects are coming in with both even and odd strand details.

Producers can accommodate bottom row patterns with both even and odd numbers of strands, but either the pallet form or the strand anchoring plate assemblies (this is required if strands are draped because the hold-down reaction rail must be centered under the soffit form) must be shifted; both approaches require added time and expense. Headers are typically made from steel, so different headers are required for the two strand patterns. A standard strand pattern is preferred to eliminate changes between FIBs and other girder types.

Richard Potts stated that it is more cost effective to add 6 strands and use a straight strand pattern than to use a draped pattern because of the improved safety of the straight strand design.

Since designers have now selected FIBs as the next direction for girder shapes in the region, rather than PCEF sections from states to the north, industry will develop a proposed deck girder shape based on FIBs.

***Action item(s) completed:***

***New Action item(s):***

*6.e.1 Lateral Stability* ..... *Active Item*

The proposed revision for lateral stability was approved at the AASHTO Bridge Engineers' meeting in Vermont earlier in the summer. The provision does not indicate the party responsible for addressing lateral stability. Reid Castrodale indicated that industry would be glad to assist the DOTs as they develop plans to implement the provisions. The approach taken by GDOT is a good one: they have specified maximum span lengths for different cross sections that were determined by lateral stability considerations. If the girder length does not exceed the limit, then lateral stability calculations are not required; if the girder length exceeds the limit, lateral stability must be evaluated, and special approval is required. William Nickas said that IN, IL & WI DOTs have done the same thing – evaluating stability for their standard shapes using the PCI approach for the range of expected handling and wind conditions and then providing maximum spans.

Reid Castrodale summarized the provisions of the revision. William Nickas pointed out that while the new provisions indicate that lateral stability must be evaluated, it does not say by whom. The provisions reference the PCI *Recommended Practice for Lateral Stability of Precast, Prestressed Concrete Bridge Girders* (which also does not indicate who should be responsible for evaluating lateral stability) and a design example that appeared in the PCI *Journal*. He said that there was a great deal of discussion in the AASHTO Committee on Concrete Design (T-10) regarding who would be responsible for performing the lateral stability evaluation, because states

differ in their approach to construction related issues. He encouraged the DOTs to look at the provisions and come up with language for their specifications that addresses who is responsible to evaluate lateral stability.

Richard Potts stated that their plants have been looking at stability for some time. They have found that pick points are typically moved in from the end of the girder to improve stability, which affects stresses when the girder is picked. He recommended that an EOR design the girder by extending strand debonding past the lift point to keep concrete stresses at lifting within allowable limits (EORs typically only consider stresses at transfer with the girder supported at the ends). If the original design does not consider lifting, then a redesign is needed. If EOR does not agree to additional debonding, then temporary top strands may be required.

The PCI Recommended Practice includes sample calculations that were computed using a MathCAD template. That template has been provided to some DOTs. The MathCAD template is being converted into an Excel spreadsheet to allow wider use. William Nickas reported that, as the spreadsheet was being completed, a few questions were encountered related to bearing pads, so these are being resolved. A four-hour instructor-led web-based course will be available by the end of the year. William offered to make available the spreadsheet to any DOTs that would like to use it to evaluate the lateral stability of their girders.

Jeff White asked if the Recommended Practice and spreadsheet evaluate stability while backing a girder. He indicated that they have had some situations where trucks have had to back girders up to 5 miles to a job site, and that backing applies different loads to the girder. William Nickas stated that this was a good question and that the effect of axial loads, which may occur from backing, are not included in the current analysis which only considers roll-over stability.

William Nickas asked the DOTs when they expected to implement the 8th edition of the AASHTO LRFD Specifications. GDOT thought they may update their practice in about six months. William asked because he is in the process of having the PCI Bridge Design Manual updated to the 8th edition (with the reorganized Section 5) and wondered when DOTs would need that activity completed. GDOT indicated that they have to determine if they are going to implement all of the changes, and then they also have to update their design calculations which are in MathCAD.

NCDOT is running a few years behind in implementing changes to the AASHTO LRFD Specifications, but they do encourage their consultants to use the latest edition.

William indicated that the changes approved in 2018 will not become official until Jan. 2019. Since there will be no interim revisions published, DOTs will have to write a bulletin that specifically adopts any interim revisions for the revisions to be used in projects prior to publication of the next edition of the AASHTO LRFD Specifications.

***Action item(s) completed:***

***New action item(s):***

- *Develop recommendations on implementing lateral stability provisions* *Industry*

6.f NEXT Beam ..... *Active*

*Lead:* ..... *Bill DuVall*

Steve Gaston gave a presentation on GDOT's implementation of NEXT F beams [***Action Item Completed***]. Most of the slides were provided by Jason Hewatt with Forterra. They have created standardized drawings for the sections to make details consistent and to provide a simple tool for use by local governments. Four projects have been let and completed. These projects came in at costs of $154 to $175/sq ft, which are high compared to a typical prestressed concrete girder bridge that usually costs about $90/sq ft. The projects use a full 8-in.-thick deck with two layers of reinforcement.

Cracking occurred at the joint between the top flange and web where the top flange had been blocked back to allow pouring the end diaphragm. The fix was to eliminate the blockout over the webs. Cracking also appeared in the longitudinal joint between girders that runs down the center of the bridge. Providing wider debonding between the flange and deck eliminated the cracking.

It was difficult to make pile bents work because of the large loads being applied by longer spans. They may try to use NEXT E girders, for which the top flange is considered part of the composite deck. They are not considering the NEXT D girders that have a full-depth top flange, because the beams are too heavy.

The presentation has been posted on PCEF website.

***Action item(s) completed:***

- *Presentation on NEXT beam projects at next meeting* *GDOT*

***New Action item(s):***

6.g Precast Substructure Elements..... *Informational*

*Lead:*.....*JR Parimuha*

**Precast pile caps**

Richard Potts provided details from a GDOT project in Gwinnet County. The caps were for a seven-pile bent and were fabricated in two pieces, with the center pile in the splice between pieces. He also provided details for a second project which used a different type of blockout for the piles. Details have been posted on PCEF website [***Action Item Completed***].

***Action item(s) completed:***

- *Distribute precast cap details for recent project* *Richard Potts*

***New action item(s):***

**Precast substructures**

No discussion.

## 7. New Business/Informational Items

*Prestressed Concrete Stay-in-Place Deck Forms*

William Nickas asked if prestressed concrete stay-in-place deck panels, which are widely used in some parts of the country (such as TX), are being used in the region. The DOTs responded that they are not being used in the region, and are not allowed in SC.

*Span to Depth Ratio Limits*

Steve Nanney asked if the optional span to depth ratio limit given in the AASHTO LRFD Specifications is being implemented by other DOTs. Using the criteria has resulted in some shallow FIB girder solutions not being allowed. NCDOT reported that they have not used the shallow FIBs yet, since they are still using AASHTO shapes for short slabs, so they had not seen the limit affect designs. Reid Castrodale stated that the limit does not affect just FIBs, but years ago had changed the required section for a 60-ft long cored slab design to a 24-in. deep section.

William Nickas discussed the source of the requirement, which was in the AASHTO Standard Specifications and was intended for pedestrian comfort. As the AASHTO LRFD Specifications were being developed, there was a huge debate on the topic, but it was decided to make the limit optional since it was not an effective approach to limiting deflections. He did not think that the limit should be a mandate but could be used to require special approval by the State Bridge Engineer if the limit was exceeded. He urged that data be provided to SCDOT to allow them to reconsider the policy. Allowing shallower sections would save SCDOT money. He gave the example that a 100 ft span when he entered public service would be a 54-in.-deep girder, but now can be achieved with a 36-in.-deep wide-flanged girder, cutting 18 in. out of the depth of the structure, saving significant costs in earthwork for the approaches for most structures.

*Seminars*

Peter Finsen discussed potential training for inspectors to accompany the NCDOT seminar in November 2018. A PCI certification school could be held with a minimum of 12 attendees. He also had a discussion with the President of Ross Bryan Associates, which does PCI plant inspections and teaches the PCI certification schools. They are willing to help with the inspector training, since they are in the plants and have information that could be used.

## 8. Develop/Review List of Action Items

## 9. Evaluation of Committee Progress/Process

## 10. Next Meeting Date & Location

Thursday, February 7, 2019 (10 am – 4 pm) at NCDOT
Thursday, August 15, 2019 (10 am – 4 pm) at SCDOT

### Adjourn

The meeting was adjourned at 4:05 PM.

**ATTENDEES:** G/C PCEF Committee Meeting – February 8, 2018 at GDOT

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