

**July 2022 ABC-UTC Monthly Webinar: DC Department of Transportation (DDOT) I-295 over South Capitol Street
Bridge Rehabilitation (Bridge 1016 NB & 1017 SB)**

| # | Questions | Responses |
|---|---|--|
| | Design | |
| 1 | Was there any rehabilitation work involved for the substructure? | Rehabilitation work on the substructure (abutments and pier) included crack injection and spall/delamination repair. Pier caps received Carbon Fiber Wrap reinforcing for added strength. |
| 2 | What design considerations were made to accommodate variability or tolerances in the bridge seat elevations considering the skew? | The top portion of the abutment and pier caps were removed and rebuilt to the desired bearing pad elevations. Final deck elevations could be achieved with the LMC (latex-modified concrete) overlay. |
| 3 | What is the design service life of the connections? | Because the closure pour consisted of Ultra High Performance Concrete which reaches a final compressive strength of up to 21,700 psi, the normal modular unit deck concrete would control the service life of the connection, ranging from 75 to 100 years. The interface of the connection would be sealed from water intrusion by the LMC (latex-modified concrete) overlay. However, the existing substructure units were estimated to have a 50-year maximum service life remaining, so these units would control the service life of the bridge itself. |
| | Construction | |
| 4 | Can you discuss closure pour details, end diaphragm details, and erection / constructability issues for this project? | These details were discussed in detail during the presentation. Refer to slides 23, 24 and 30 for details. |
| 5 | Can you discuss the joint details for this project? | The joint details were discussed in detail during the presentation. Refer to slide 22 for information. |
| 6 | What were the challenges during the closure pour of the UHPC? | The only challenge presented was insufficient bar lap. In several isolated areas, the 6-inch minimum bar lap was not achieved because the gap between units was wider than expected. In these areas, we proposed supplemental reinforcing bars in order to make up the 6-inch minimum lap. |

| | | |
|---------------------------------|---|--|
| 7 | What was the biggest challenge for the contractor to overcome in this project? | The biggest challenge would be the MOT (maintenance of traffic) coordination with the adjacent Malcolm X Interchange project to the North. During critical weekends, the contractor had to coordinate the MOT to make sure his setup would not conflict. During certain periods, the MOT setups between each project aligned, so the communication and coordination was a major challenge. The next biggest challenge would be the critical weekend schedule, to ensure all construction activities were manageable within the short time frame of the weekend closures. |
| 8 | What are the lessons learned from this project? | Lessons learned were discussed in detail on slide 30. |
| Cost | | |
| 9 | Can you discuss the effects of skew on the cost of this project? | While the exact difference between "cookie-cutter" modular units and 20 unique modular units isn't known, it can certainly be assumed that the fabricator had to increase his costs due to the constant adjustments being made between all units, in addition to all the shop drawing details and reviews that were required for the project. |
| Questions during Webinar | | |
| 10 | Did you include costs associated with accidents in your user cost/ benefit analysis? This is significant as construction zones are magnets for accidents. | The Loss of Public Benefit Study was completed primarily to determine a Disincentive Cost to the contractor for failure to open the bridge up by 4:30 AM Monday morning. The costs associated with the Loss of Public Benefit Study (also known as User Costs) encompass the benefits that users of the roadway will enjoy when using the completed project. These benefits are typically assumed to consist of quantifiable items such as travel time improvements, reduced fueling costs due to shorter distances traveled or smoother operations through a work zone area, less wear and tear on vehicles with shorter or smoother trips, and improvements in safety. |
| 11 | What are the average dimensions of each module? What was the spacing of the girders? | The span length for the units ranged from 52 ft to 78 ft. Normal girder spacing varied due to the flare of the girders, but in general was around 5 ft. |

| | | |
|----|---|---|
| 12 | How do you inspect the FRP (fiber-reinforced polymer) condition during inspection to ensure that it is bonded to the concrete in 5 years, 10 years, or more? | The carbon fiber wrap is inspected similar to normal concrete. A hands-on inspection will determine if the fiber has become debonded or loose. If not installed properly, water may become trapped behind the wrap and pockets would be visible to the inspector. Typical service life for the fiber wrap is up to 50 years. |
| 13 | Was there an incentive payment if the contractor finished early? | There was no incentive payment for early completion on this project. |
| 14 | Is it true that normally a "strip seal" would not have a trough, and drain off the bridge at the end(s), e.g., maybe with a device to get the water away from the pier? For this project, did you add extra protection with a trough as well? | The trough was included to help control the flow of water onto South Capitol Street below. A downspout was incorporated at the end of the trough to help collect the water and empty it onto the median barrier below, reducing splash. The trough was also added as a "belt and suspenders" approach in the event that the strip seal leaks in the future. |
| 15 | Can you elaborate more on the carbon wrap for this project? What literature and references did you use in the design and construction? | For this project, the designers provided on the plans the required amount of shear and positive moment capacity we needed the fiber wrap to achieve. Our independent calculations provided us with an estimated amount of fiber wrap required; however, the manufacturer was ultimately responsible for determining the actual design. ACI 440.2R-08, NCHRP Report 655, and NCHRP Report 678 are all good references for CFRP (carbon fiber-reinforced polymer) design. |
| 16 | What was the estimated construction time if a traditional construction method (with staging) was used? What is the time saving between ABC and traditional methods? | Our project was completed in 26 weeks, and we estimate that traditional staged construction would take 42 weeks. Therefore, 16 weeks were saved by using Accelerated Bridge Construction (at approximately 20% higher cost). |
| 17 | Did you consider any other steel alternatives than I-beams? | Steel plate girders were really the only alternative considered. We tried to increase the clearance on South Capitol Street as much as possible as well as reduce as much load as possible on the existing substructure units. Therefore, steel made the most sense for this project. |

| | | |
|----|---|--|
| 18 | <p>What is the logic in using steel beams (same as the old bridge which had corrosion and fatigue issues) and the superstructure with an expansion joint? Was a jointless concrete superstructure option evaluated as part of the structure type selection process?</p> | <p>The fatigue issues on the existing bridge arose from the use of welded cover plates. The proposed bridge did not use cover plates, so the fatigue criteria was much more favorable. The designers made every effort to reduce the load on the existing pier columns and foundation in order to re-use them. In order to do this, two lines of expansion bearings would help alleviate some of the load. Therefore, the expansion/contraction nature of the expansion bearings would not be ideal for a link slab or jointless bridge deck detail.</p> |
| 19 | <p>Detours were discussed in the presentation. Also, complete closure was not allowed. Can you explain how the traffic was managed on the detours and the partial closures at the same time?</p> | <p>Due to the high ADT (> 40,000) on the I-295 bridges, complete closure was not permitted. During the critical weekends, traffic remained open on I-295. Traffic was reduced down to one lane, and an alternative detour around the work zone was also available to the traveling public in both the Northbound (NB) and Southbound (SB) directions.</p> |