May 2019 ABC-UTC Webinar Featured Presentation: Lightweight Superstructure Replacement of MDTA's Patapsco River Flats Bridge		
#	**Questions**	**Responses**
	Design	
1	Could you discuss flood risk, probabilities of overtopping at Q50, Q100, Q500, and mitigation efforts?	Historically, flooding has not been an issue at this site. Also, the bridge length, pier locations and roadway profile were not changed. Therefore no hydraulic studies were performed.
2	How was the specialty engineering specified for the temporary work?	There is no temporary work on this project.
3	Is a steel grid deck partially filled with lightweight concrete considered an Exodermic deck? What is the converted unit deck weight in psf?	Yes, the grid deck is an exodermic deck. The unit weight of grid deck partially filled with all-lightweight concrete (100 pcf) is 50 psf.
4	Was the deck precast?	The deck was not precast.
5	How does the bridge rail connect to the steel grid deck?	The bridge rail is connected to the grid deck similar to a traditional reinforced concrete deck. The deck is full-depth concrete under the barrier to facilitate the railing connection.
6	What is the percent reduction in weight of this deck compared to what it replaced? What is the increase in load-carrying capacity?	The use of grid deck partially filled with all-lightweight concrete resulted in about 43% reduction in weight. The bridge is designed for an HS-20 live load capacity.
7	Why weren't more than 50% of the joints eliminated?	Due to the constraints of the pile layout as discussed in the presentation and as shown on Slide 18, the existing expansion piers could not be used as center piers in a continuous unit. Also, the increased reaction at the center fixed piers was a limiting factor. Therefore, the continuity was limited to two spans.
	Construction	

8	Did MDTA test the lightweight mix for freeze thaw cycles? What test was used?	The specifications and special provisions did not require freeze-thaw testing of the deck concrete. However, the qualification tests for the lightweight aggregate (AASHTO M 195 or ASTM C330) require freeze-thaw testing of base concrete mixtures using the coarse and fine lightweight aggregate separately. Both tests passed with very little or no degradation after 300 cycles of testing. The test reports are provided for information.
9	Did the lightweight concrete pass the freeze-thaw test?	See preceding comment.
10	What were the lightweight concrete specification requirements - shrinkage, air, water/cement ratio, and slump?	See the concrete specifications located elsewhere.
	Maintenance	
11	Was any type of corrosion protection used on the steel grid deck?	The grid deck components are galvanized, as is the reinforcing steel in the grid deck. The reinforcing steel in the bridge barriers is stainless steel.
12	What is the expected design life of the new bridge deck?	The new bridge superstructure should have an expected design life of 75 years.
	Cost	
13	Did you compare ABC cost to user costs?	No.
14	What was the cost of the LWC compared to conventional concrete? If it cost more, how was the added cost offset?	Using conventional concrete was not an option for this project due to the limitation in the capacity/layout of the existing substructure. Therefore, no cost comparison was worked out for different concrete mixes.
15	Please address ABC time versus conventional construction for this project.	The used of grid deck resulted in a 38% reduction in the duration for deck placement. The re-use of the existing substructure also provided a significant savings in time and cost.
16	Can you comment on ABC hurdles and claims related to weather, 3rd-party delays, material delays, etc.?	There have been no claims on the project.

	Other	
17	How many states would accept lightweight concrete?	We are not aware of a state-by-state acceptance of lightweight concrete. In Maryland, lightweight concrete is frequently considered and used where its benefits provide value to bridge owners.
	Questions during Webinar	
18	What durability requirements were specified for the lightweight concrete mix? Was ASTM C666 Freeze/Thaw testing included?	LWC typically meets freeze thaw requirements when conducted in accordance with modifications to AASHTO T 161 (ASTM C666) specified in AASHTO M 195, which requires drying of specimens for 14 days after 14 days of initial wet curing; then soaking for 1 day prior to beginning the test. See also comment #8.
19	What types of lightweight aggregates were used?	Stalite supplied the lightweight fine and coarse aggregate. The material provided by Stalite for this project is an expanded slate product.
20	Slide 6 - Does Maryland use deicing salts? Is that something that contributed to the corrosion?	Maryland uses deicing salts and its use is undoubtedly one of the contributing factors to the corrosion.
21	With the reduced deadload from using the partially-filled concrete deck, were there any issues with uplift at the supports during design?	No uplift was noted, since the two-span units were essentially balanced.
22	Loads from the '50s were less than current prescribed loads. How did you account for this in your substructure calculations? (Slide 15)	The original bridge was designed for an HS-20 live load. An increase in live load capacity to the current TL-93 was not possible, so the replacement superstructure is also designed for an HS-20 live load.
23	Can you explain and justify again why you did not use HL-93 live load for the rehabilitation and only the HS-20 truck?	Since we were re-using the existing substructure, the replacement superstructure live load capacity was controlled by the capacity of the existing substructure.
24	Was CM/GC or CMAR used for the contracting method?	No, this project was traditional design-bid-build.
25	Slide 20 or 22 - The steel grid is "attached" to the girder flanges only through the shear stud action?	The full concrete pour including shear studs over the girder flanges facilitates the composite action between the girders and the grid deck.

26	What is the life expectancy of the deck solution implemented for the amount and kind of traffic on the route?	The new bridge superstructure should have an expected design life of 75 years. The bridge has a design year ADT of 49,385 vehicles per day, with 3% trucks.
27	The slide shows span length = 96 to 120'. This likely shall be divided by 2.	The span length on the slide is a total span length of a two-span continuous unit. Some of the spans were unequal but typical span unit was two - 56' spans. The individual span lengths did not change.
28	What does the bridge cost include/exclude?	The $220/SF unit bridge cost cited in the presentation includes mobilization, all the superstructure and substructure costs. This cost includes the material, equipment and labor required to complete the bridge work. Miscellaneous, non-bridge items are not included in this unit cost.
29	Is the bridge cost for the bridge only, or does this include engineering and mobilization costs?	The unit bridge cost of $220/SF cited in the presentation is the construction cost of the bridge and includes the mobilization cost. Miscellaneous non-bridge items are not included, nor is the engineering design fee.
30	Why were there two 55-ft simple spans on the northbound side but, from what I understood, those spans were not used on the southbound side?	On slide 18 the pile layout for the northbound side starts with an expansion and ends with an expansion. The expansion piers were supported by 3 piles and did not have adequate capacity to be used as a center pier or fixed pier for a 2-span unit. Therefore, the northbound bridge had simple spans at the beginning and end.
31	Was the contractor able to work year-round during the 3-year schedule?	The contractor was able to work year-round with special attention required to concrete curing/placing during cold weather.
32	What is the aggregate material? Does it satisfy the durability requirements for concrete aggregate? What performance issues are anticipated with high absorption?	The aggregate material is expanded slate which has a relatively low absorption (approx. 7.5% coarse, 12% fine). However, absorption does not have a direct impact on the durability. Tests have shown that LWC that has been ground and/or grooved can also have good freeze-thaw resistance. See posted test results for a typical NCDOT sand-lightweight concrete mixture.
33	What were the reasons for not having fully-precast grid deck panels placed on the beams?	A fully-precast grid deck panel would have been too heavy to transport and erect. A much larger crane would have been required that was not feasible to used on the existing substructure.

34	Were there environmental concerns with the old superstructure (e.g. asbestos, lead paint, etc.)?	There was presence of lead, so the contractor's demolition plan included not cutting through the existing beams to prevent any exposure. There was no asbestos present in the existing structure.
35	Can you talk about the expansion joint elimination?	The original bridge design used short spans (54-68 feet in length) with many expansion joints, typical of bridge designs from its era. The presence of all these expansion joints was a contributing factor to the corrosion and deterioration of the bridge. The owner desired to eliminate as many expansion joints as possible as a goal for this project. Within the constraints of the existing structure, the use of 2-span continuous units allowed the expansion joints to be reduced by 50%.
36	Why was lightweight concrete used, as the substructure piers are capable of heavy construction crane loading? What was the condition rating of the substructure?	The existing substructure was capable of supporting the crane loading which was a temporary loading condition. The substructure has adequate capacity to support HS-20 live load. Following the substructure rehabilitation project which preceded the suprstructure replacement project, the condition of the bridge substructure was Satisfactory.
37	I was wondering if you could discuss the removal of the old superstructure. I thought taking out a span, backing up and taking out another span, but the photos show the crane isolated with spans on both sides of it removed.	Two cranes were used during construction. The demolition crane moved ahead of the erection crane. The demolition crane was set over Span 3, it would then remove Spans 1 and 2. The temporary support was built by the contractor to span across the existing substructure to support the erection crane. The contractor built a temporary platform usually 2 spans at a time, the erection crane would move from Span 1 to Span 2. After it got to Span 2, the Span 1 temporary platform was dismantled and stored to be reused. This crane would then facilitate the erection of girders and grid deck of Span 1 while setting on the "island" platform in Span 2.
38	What drainage solution did you use for the bridge? Scuppers?	Scuppers were used for drainage.
39	How did the erection crane advance from one span to the next?	The contractor built a temporary platform usually 2 spans at a time, the erection crane would move from Span 1 to Span 2. After it got to Span 2, Span 1 was dismantled and stored to be reused. This crane would then facilitate the erection of girders and grid deck of Span 1 while setting on the "island" platform in Span 2.

40	What type of new deck joint was used?	A neoprene strip seal was used.
41	Can you play the time lapse again?	The time lapse had been posted on the ABC-UTC website.
42	Did you test your lightweight concrete for freeze-thaw conditions? What tests were performed?	See responses to Questions #8 and #18.
43	Are there any long-term durability concerns with lightweight concrete bridge decks?	Tests have shown that LWC can have equal or better long-term durability compared to NWC of the same quality.
44	How was the temporary median barrier attached to the new deck?	We did not have a temporary barrier on the new deck.
45	Was it difficult to convince the owner to use the Exodermic deck?	Due to the owner's desire to re-use the substructure and to reduce the number joints, developing a design that met both these goals was critical. Grid deck partially filled with all-lighweight concrete was the only option that met these design goals, so the owner totally supported this solution.
46	Were the barrier walls constructed with lightweight concrete as well?	The barriers are all-lighweight concrete as well.
47	How did you made the two spans continuous?	The superstructure is designed and detailed as a 2-span continuous unit. The grid deck has additional reinforcing steel over the pier in the negative moment region. The bearing pedestals at each pier were rehabilitated and detailed to accommodate the new 2-span continuous configuration.
48	What is the estimated service life? It seems this is as close as one gets to 100 years.	The new bridge superstructure should have an expected design life of 75 years.
49	Is this bridge over fresh or salt water?	The bridge is over brackish water.
50	Was galvanized or painted steel used for the girders?	The girders are painted steel.