ABC-UTC December 2022 Monthly Webinar: UHPC Connections for Accelerated Restoration of Live Load Continuity – Oklahoma's U.S. 183/412 Bridge over Wolf Creek		
#	**Questions**	**Responses**
	Design	
1	How often does the Oklahoma DOT see loss of live load continuity with precast prestressed girders?	After Walt's field survey last week, we are not able to answer this question. Walt found continuity where he did not expect to find it. We need to instrument the bridges and do more surveys in order to answer this question.
2	Where can we find the recommended design guidelines for the concepts presented during this webinar?	The current ABC-UTC project will result in a final report and ABC-UTC Guide that will be available on the ABC-UTC website, hopefully early in 2023.
3	Will this method be a go-to option in the future for system-wide use, or is it still in the early stages of testing? Are there other uses for this technology?	We are still in the early stages of testing. Some of the other potential uses for UHPC in repair are included in the presentation. These include UHPC joint headers, beam end repairs, and overlays.
	Construction	
4	Is the Oklahoma DOT developing this to a point where it becomes a standard with specifications for the materials?	Not at this time.
5	Is the UHPC material used in this project proprietary or non-proprietary?	The material used in this project was proprietary.
6	It seems that this type of connection would produce more deck cracks at the supports. How do you limit those cracks and any moisture intrusion associated with the cracks?	With one known exception, moisture was not penetrating the deck to reach the linkage blocks. Note that the strands in the linkage blocks on Wolf Creek shown in the presentation slides (Slide #64) were in good condition.

7	What are the lessons learned from this project?	Lessons learned are included in the presentation on Slide #75. They include the need to carefully consider formwork pressure and formwork design for these deeper sections, ensuring that air can escape when placing through small holes, that UHPC can remain flowable for a significant time after placement, and filling the formwork with water or using a nonabsorbent material is a better method for prewetting the forms than the sprayer that was used.
	Cost	
8	What is the unit cost of the UHPC?	The unit cost of UHPC is highly dependent on the material used and the services provided by the manufacturer (e.g., onsite technician, mixers, shipping, etc.). The material used in this project was $3,000 - $3,500 per cubic yard at the time, but UHPC can range up to $10,000 per cubic yard and non-proprietary UHPC can be in the range of $800 per cubic yard. These costs are typically for the material alone and do not include additional costs associated with manufacturer technical support and equipment supply for mixing.
	Questions during Webinar	
9	Walt said that the Oklahoma DOT did continuity for live load from 1978 to 1985. Why did the Oklahoma DOT stop? Have they started doing it again?	ODOT stopped using this linkage block detail due to observed cracking in the connections. ODOT has not started using this type of connection again.
10	On Slide #10, please describe the linkage blocks between the girders.	The linkage block is a conventional block of concrete placed between the ends of individual girders on subsequent simply-supported spans. It is typically the same width as the bottom flange of the girder, but may taper to the width of the top flange and is 10-12 inches long in the direction of the span. The block is connected to the bottom of the beam using strands extended from each beam and is integral with the deck.
11	Is the UHPC cost of $800/cu yd the pure material cost, or is it the cost from a batch plant?	The $800/cu yd is just the material cost. A large portion of the cost (>$500) is the steel fibers.

12	What was the weight of the loaded trucks that were used?	Total weight of each truck of the two trucks was approximately 51,000 lb for the first load test and 55,000 lb for the second load test.
13	Did you run a load test after removing the concrete diaphragm and before casting the UHPC?	Unfortunately, we did not.
14	Was traffic maintained across the bridge while repairs were being cast?	One lane of traffic was maintained throughout the repair, and traffic lights were used to control traffic flow. Connections on one side of the bridge were replaced, and then traffic was moved over for the other side of the bridge.
15	Normally it wouldn't be advisable to try curing a continuity joint repair under full live load traffic. Was moving live traffic just over to an adjacent lane enough protection to allow the UHPC to cure for the couple of days it needs to reach 10 ksi strength?	This is a good question. We do not know if it was sufficient protection for optimum performance, but we did not observe any detrimental effects.
16	It was mentioned that the contractor did the bridge a half at a time. Since bridges are designed to distribute the load, it would seem that the last joint repaired would take distribution loads while curing. Did they notice any cracking or ill-effects from this?	We did not observe any cracking or ill effects that could be attributed to this load distribution.
17	Do you ever see this technology being used to reduce the 90-day wait time for beams used in simple-made-continuous bridges?	We have not seen that done. It does seem possible that the additional tension strength and bond strength of the UHPC would allow for greater resistance to induced tension strain and reduce the need to wait 90 days.
18	What was the reason for the pier diaphragm cracking?	It was most likely caused by restraining moments (positive moments) induced by time-dependent creep and shrinkage in the prestressed girders resulting in a slight shortening of the prestressed beam, especially on the bottom flange, and an upward camber movement. This deformation is further ehanced by the effect of typical temperature gradients. The effect is illustrated on Slide #4.

19	In terms of the rigidity and due to the high compressive strength of the UHPC in comparison to the conventional concrete used for the girders, did you check the interface between the continuity joint and the girders? Do you continue to monitor the continuity joint?	We did consider the effect of bond between the UHPC and the conventional concrete. With proper surface preparation and prewetting, we have seen the bond exceed the tension strength of the conventional concrete. This is also shown in the literature. However, the surface preparation used in this particular implementation was limited. We only monitored the joint instrumentation for one year, but do visit the bridge to do visual inspections of the connections approximately one time per year.
20	Did you use hydrodemolition to remove existing concrete from the rebar?	Hydrodemolition was not used to remove existing concrete from the rebar. Traditional methods of demolition (jack hammers, demo hammers, etc.) were used to remove the existing concrete.