

August 2016 ABC-UTC Webinar Featured Presentation: PennDOT SR 30 over Bessemer Avenue Bridge Replacement in One Weekend

Q&A Session: Questions	Responses
Decision Making/Planning	
What ultimately drove the decision to go this route of rapid ABC construction?	Mainly because it was a busy road(21000 ADT) with a detour that was 17 miles long. The duration ultimate came down to how fast could this work be done using ABC.
Why one ABC method was chosen over another?	Space and ROW restrictions at site made an SPMT move or a lateral slide not feasible. So PBES was the preferred option.
Design - Engineering/Details/Material Selection	
How would this change if you had box beams, post-tensioned and with grouted keyways?	The weight of the box beams would have been an issue for erection. Also durability of grouted shear keys has not been good.
Is steel a better choice than concrete for fast bridge replacement ?	In this case the lighter weight of steel composite modules made steel the better option. In some cases concrete deck bulb tees can be more economical.
Why were steel girders used instead of prestressed concrete girders?	We have used steel and prestress concrete. Steel was lighter and we were trying to keep the pick weight down.
Why aren't more DOT's utilizing the benefits from expanded shale lightweight aggregates on composite bridge decks and barriers?	For ABC lightweight concrete is a plus. For CIP projects this may not be a consideration. Also state preferences can dictate the use of lightweight aggregates.
How were the precast abutment caps attached to existing abutment ?	Dowels were drilled and anchored into the existing abutment. Cap was set. And all voids in cap and below cap were grouted. Refer to slide 26 of the PowerPoint Presentation for further details.
Have lightweight traffic barriers been crash tested, and how will that affect the long term durability given the use of de-icing?	We have used lightweight concrete in barriers before, don't know if they have been tested. Not sure about long term benefits.
On previous projects, PennDOT used precast approach slabs and had trouble with them. What was done to mitigate those problems?	Approach slab was placed on the back wall which was included in the deck slab diaphragms.
Design/UHPC	
Did Lafarge supply the UHPC? Did the contractor experience any difficulty in installing the UHPC material?	Lafarge was the supplier and provided a technician for a test placement and the production placement. The production placement went very smooth but I believe this was due to the test/mock up placement. This gave the contractor the chance to not only test his procedures but also to allow the crew to become familiar with the material.
How long were the UHPC joints cured before letting traffic on them?	The joints achieved strengths of 12 KSI in 12 hours by maintaining a curing temp of 120 degrees.
What was the cure time on the UHPC joints before loading (construction loads and traffic)?	The joints achieved strengths of 12 KSI in 12 hours by maintaining a curing temp of 120 degrees.
Is an overlay used on decks with closure pours to prevent the joints from leaking?	No the joints are water tight. The overlay allows for a smoother, uniform ride. It also helps to protect the joints. The joints if left exposed can be a visual distraction as the joints are very noticeable and could be could be confused with pavement markings.
Tolerances	
Show fabrication and construction tolerances handled during superstructure placement and design details for UHPC placement.	Plans had specific tolerances given for the deck fabrication and setting of modules. Typically a 1/4" + or - These were verified in the plant.
Construction	
What percentages of overall time are attributed to: Demo, Abutment Mods, Placement, and Closure Pours?	Demo/cleanup: 12 hours, Abut mods: 12 hours, Deck and abut set: 8hours, joint forming: 8 hours, UHPC placement:6 hours, Curing 12 hours
During the 57hrs closure what component of the super structure were successfully installed before reopening.	Precast Abut Cap, Deck Modules, Abut Modules.
How challenges for hauling the precast sections, large crane use, O/H utilities, and removal of exit. structure were factored in?	This was difficult. The 2 fascia deck modules were classified as super loads and required a 500 ton crane. The overhead lines were deenergized but were still difficult to work around.

Provide discussion on Change Orders, Delay Impacts and Shop Drawing Approval Processes.	Projects only additional work was some over excavation of subgrade material that became saturated and additional paving limits to improve the ride. Shop drawing approvals were not an issue. HNTB performed these reviews in a very timely manner however the contractor would have liked more time receive those approvals and time to secure the necessary materials for fabrication.
Were the aerial cables shut off that cross the job site?	Yes they were deenregized
End slabs and lugs are precast - were you able to get full contact between them and if so, how?	Yes all pieces fit well. The Mock setup allowed for verification of proper fit up. Some minor issues were identified and addressed prior to final placement.
What are the drivers that will tell you to use cranes vs. strand jacks to shift precast elements in place ?	In this case crane based erection was the most logical option. The cranes were able to lift the pieces and reach the setting locations while working under the overhead wires. Strand jacks would not have fit this application.
Costs	
What was the cost per square foot compared to a normally built bridge in Pennsylvania?	Average Superstructure replacement costs is \$400/sf. We have had them as high as \$832. They would typically not include precast or sub structure work like bearings or back walls. This project came in at roughly \$718/sf but this included the substructure items mentioned above.
Cost comparison to conventional construction.	In this situation the costs for ABC was in line with typical construction. The existing structure was not wide enough to maintain a lane in each direction, and would have required significant modifications to remain open during construction. As a result that money was instead used to accelerate.
Close out	
Was this more cost effective than using half width construction?	Half width construction was not a viable option due to the highly deteriorated condition of the superstructure. Partial demolition and maintaining traffic would have been too risky.
What are your lessons learned?	Listed in the presentations second to last slide.
Questions during Webinar	
Was there any risk management included in the construction phase to insure ABC work is completed as planned.	Going into the weekend numerous discussions took place to determine what item were critical and what are the alternatives if something goes wrong. With precast modules you limit that exposure but the contractor did have additional men, parts and equipment in the event of any issues. We also looked at traffic management and what is most critical to the public. This is why we placed the joints in a manner that would allow us to have a partial opening.
What is the span ? Just saw the info on this slide. 54 ft.. thanks	Span was 54'-0" measured along the local tangent
Why are you using 4 ft 7 inch and 3 ft 6 inch spacing between girder? Was it because you wanted to use I beams?	We wanted to keep the width of modules within 8'-6" for transportation, while using two beams for each module. This gives a narrow spacing between girders.
How is thermal movement accommodated?	Use of elastomeric bearings for expansion.
How was thermal expansion provided for?	We had laminated elastomeric bearings under the beams at the abutments.
How challenging was the combination of small spacing and having cross frame compared to other options?	Not a problem. We had channel diaphragms.
Was the lay-down area for prefab elements close to the project?	No the pieces were fabricated 40 miles away. The day before the closure they were trucked to numerous locations closer to the structure.
Slide 36 - Was any protection of the abutments provided against the demo of the superstructure?	No the abutments inspected prior and post.
I did not see from the photos any dowels installed on the existing abutments to tie-in the precast sections.	They were drilled and set after the abutment caps were set.
How was noise mitigated since the work is in a residential area? During the whole work process?	Not much could be done. We met and spoke with the residents to inform them of the scheduled work. One way we helped sell this is that we would only be impacting them for two weekends instead of entire season if this was performed in a conventional way.
Any incentives/penalties in the contract against the closure window?	No incentives but there was a penalty of \$4600 per hour.
Slide 42 - Were the deck panels match-cast?	Yes. The entire structure was essentially built in a conventional way. The cast and set the caps at the grade and position they would be set in the field. Steel girders were then set on the caps and the deck forming, rebar and concrete were placed .

What is the UHPC unit cost and what is the pay item unit?	The UHPC was include in the LS bridge item but has an estimated cost of \$10,000 per CY
What was the reaction of the neighbors to the night time work?	Not thrilled but many sat outside and watched. Many people were fascinated that we could replace a bridge in a weekend.
How difficult was it to install the channel/plate between the deck section girders?	The diaphragm connections were made while the modules were being set and were not an issue.
What were the incentive/penalty amounts?	No incentives but there was a penalty of \$4600 per hour.
Was the additional vertical clearance under the bridge primarily achieved by raise in pier cap height ?	Yes and the old concrete beams were very deep.
What were the liquidated damages for opening after 6:00 AM?	No incentives but there was a penalty of \$4600 per hour.
Did you have problem removing the plywood off the closure UHPS areas?	No but only because the contractor learned the proper time to do so during the mock up placement. If left for 12 hours very difficult.
Why was a fence placed over the rail on one side of the bridge and not the other side?	The pedestrian sidewalk is only on one side of the bridge.
How did you manage construction work periods and shift changes with both management and labor?	This was very challenging for the contractor. As they got behind schedule, many times they had crews standing around waiting. With that said the contractor preferred having them there ready to go when needed.
What was put down to support the sleeper slabs?	2A subbase material on a class 4 geo.
How was noise mitigated; especially through the night operations.	Not much could be done. We met and spoke with the residents to inform them of the scheduled work. One way we helped sell this is that we would only be impacting them for two weekends instead of entire season if this was performed in a conventional way.
Hom much was the net profile raise at the bridge?	Less than a 1/2"
The steel shims used to level the abutment caps did not appear to have an sort of corrosion-inhibiting coating. Was there consideration given to the effect of corrosion of the shims and consideration for using plastic shims.	They were stainless steel
Was heat added to the UHPC to accelerate curing?	Yes heated blankets above and torpedo heaters under the structure.
for John Myler: slide 17 - what were the actual times compared to those estimated?	Demo/cleanup: 12 hours, Abut mods: 12 hours, Deck and abut set: 8hours, joint forming: 8 hours, UHPC placement:6 hours, Curing 12 hours
How much time elapsed between placement of the deck and placement of the latex?	One month. Holidays and weather delayed the second closure
Can you please confirm that you did milling and shot blast before LMC?	Only milling and pressure washing in lieu of the shot blasting and pressure washing.
Was there any special concerns with grinding the UHPC closures as part of the deck preparation for the LMC overlay?	No as we were only scarifying the surface.
What type of bearings were used?	Steel laminated elastomeric bearing pads
Also, were there any anchor bolts at bearings?	No
Do you get same life span for the existing abutment and the new super structure? What was the condition of the existing abutment? I mean cantilever retaining wall or counter fort one?	Except for the top of abutments we found the rest of the abutments and wingwalls could be rehabbed. There were cracks and spalls that needed repairs. The tops were replaced with a new precast cap. The service life of the abutments may not match that of the superstructure but sufficient to warrant retaining them.
The applied loads to abutments got lighter but the abutments got taller, so you did you have to analyze the abuts?	Yes it was analyzed but since the deck modules got lighter with the steel girders, the existing sub structure was adequate.
If the superstructure is not anchored/fixed at any end, what prevents it from shifting longitudinally?	The structure is fixed at Abutment 2
Any leveling shims for the deck required?	No
Designing hinges in the abutment at joint between the precast cap and existing abutment?	There were no hinges provided in this case between the cap and abutments. The superstructure was on elastomeric bearings that allowed rotation and sliding.