

July 2018 ABC-UTC Webinar Featured Presentation: Route 37 EB Mathis Bridge – NJ’s Largest Precast Exodermic Deck Replacement Project		
#	Questions	Reponses
	Design	
1	What is an Exodermic deck replacement?	It is a combination steel grid with partial-depth concrete decking that utilizes concrete very efficiently, where needed in compression, while tension is taken by the main WT's of the grid system and the single layer of rebars. This results in an overall composite, stiff deck, at a lower weight/SF.
2	What was the cost/benefit consideration of using Exodermic deck over other solutions (prefab concrete deck or orthotropic steel)?	The seasonal restrictions for deck construction (November to April only) and cold weather concrete placement in the Northeast would have tripled the duration at a higher cost for a cast-in-place concrete deck. Reduction in deck weight to improve live load capacity was more easily achieved with the Exodermic deck and its 25% reduction in deck weight compared to a full-depth precast panel option, and these benefits were achieved at least cost. An orthotropic deck was not considered.
3	What is the bridge's durability history?	Assuming the question is for the durability history of Exodermic decks in general, the response is that there have been many Exodermic deck projects around the country. We know that our own projects from 2007 - Exodermic cast-in-place decks - are functioning very well. The Tappan Zee Bridge in NY had a large quantity of Exodermic deck installed in the 1990s, about 30 years ago. We expect a longer life with precast HPC Exodermic decks.
4	What NEPA Section 106 consultation is required for rehabilitating older bridges in New Jersey? Is it cumbersome?	This bridge was not on the State or National Register of Historic Places, thus only one meeting with the SHPO was required to get concurrence. However, we replaced a concrete deck with a concrete deck, open grid deck in the bascule span with an open grid, provided an open railing system similar to the existing, and matched the paint color as well.
5	What methods were used for corrosion protection?	Galvanized steel grid, form pans, and reinforcement with 2.5 inches top cover, High Performance Concrete, High Early strength Class A concrete closure pours, and a Polyester Polymer Concrete overlay. Bottom cover was 1.25 inches with galvanized form pans left in place for the galvanized grid deck. Railings were galvanized and painted.
6	How much did it improve the structure's load rating?	The approach spans were improved to HS -25 Live load.

7	Why was lightweight concrete used for the panels? Were there any issues with the lightweight concrete in fabrication or installation?	Lightweight concrete was not used in the Exodermic deck; however, the deck system itself was 25% lighter than a conventional deck.
8	Was the Exodermic deck used on the bascules leaves?	No - in the weight-sensitive bascule span the trunnions controlled, and they were not being replaced. Hence, a galvanized open-grid deck was used in the bascule span.
Construction		
9	Did the state implement any prequalifications or certifications for the precast slab manufacturer within the bid documents?	Yes - indeed, strict requirements were stated for experience, certifications, and qualifications, plant and portions and storage facilities.
10	Was there traffic staging over the two-year construction time?	Each season the traffic was shifted to the Westbound structure from November to April and the Eastbound bridge was completely closed for construction.
11	Can you discuss some of the traffic management challenges?	Advance notification of traffic patterns was conveyed by newsletters, website data on the NJDOT site, local and community newsletters, mailings and public information center. The ADT increases three to four fold between May and September, and drops off thereafter, so our traffic shifts in the winter months between November and April were much less of an impact to the users. Mariners were notified through the US Coast Guard of restricted span openings.
12	What happened to the old bridge? Was any of it recycled?	The old deck was recycled off site to be used as aggregate for roadway fill. Special demolition and disposal for the safetywalk that contained a Transite conduit were followed.
13	What is the main lesson learned to make the next ABC project even more successful?	Production facility capabilities are important, advance action by the prime contractor in getting many hundreds of shop plans approved with production in mind, aging of the panels to take out creep and shrinkage and onsite storage areas. Caution in specifying fittings/castings in precast panels - vet it thoroughly for field fit-up.
Maintenance		
14	How are repairs made to the precast concrete if the concrete deck becomes deteriorated?	From below, it is less likely we will have any more deterioration than a regular concrete deck, as the steel galvanized pans are left in place. From the top, we have minimized the possibility of deterioration due to the HPC and the PPC overlay. However, when necessary, repairs from the top would follow standard concrete repairs.

15	Are there any maintenance issues with Exodermic bridge decks?	We have hot-dip-galvanized WTs, galvanized form pans, HPC concrete, 2.5 inch top cover, and a 3/4 inch PPC to largely eliminate maintenance concerns, so we certainly expect no more maintenance than with any other concrete deck, perhaps well lesser.
Cost		
16	What is the cost per SF of precast deck for fabrication, delivery and installation?	For our project the unit cost of \$79/SF, installed including the overlay, galvanized reinforcement and shear studs, in the northeast region, was very comparable to a conventional poured-in-place concrete deck. Construction time, given our constraints, was cut by at least 50%, perhaps more. However, we had a lot of repetitive panels and details, and a very large quantity.
17	What is the unit cost and construction time compared to convention CIP deck replacement?	See above for our specific bridge's cost. Precasting a prefabricated grid along with prefabricated railings, in our case, cut down at least two seasons, if not more, compared to a CIP deck.
General		
18	How can a consultant overcome the fear of underestimating preliminary ABC costs to a DOT without local cost data for type decisions?	Now there are numerous ABC projects all over the country and costs readily available from State bid tabs. Geographic locations of the project would have influence on the costs, but one should be able to come up with reasonable expected cost and compare it to typical conventional bridge costs in that area.
Questions during Webinar		
19	Was the deck profile milled and, if so, was it more difficult than normal due to all the panels and closure joints?	The deck cross-section was crowned and the panels fabricated and set with the slopes, by leveling bolts and variable haunches over the stringers. The PPC overlay was a constant 3/4 inch thick (except in the cases where panels were not cast with the slope). The PPC was transversely saw cut with grooves for traction. Grid panels can be fabricated with cross slopes and concrete profiled in the plant, and field overlay can be well controlled.
20	Slide 13 - Was it OK for trucks and equipment to drive on the deck prior to the pours over the girders?	Detailed calculations by the Contractor's Professional Engineer for stress distribution, and ONLY at specific locations of the larger truck, were considered. The pump/cute was extended as far as feasible and smaller buggies were used to deliver the closure pours. And a timber matting by design was utilized for distribution of the specific loads.
21	Slide 16 - Any issues with vehicle breakdowns or emergency access with the reduced lanes?	We had a special pay item and specifications for Emergency Towing Service, which mandated tow trucks at each end of the mile-long structure. We had a few instances where the tow trucks were deployed to clear breakdowns within minutes.

22	What is the design life of the Exodermic deck? How can this kind of deck be replaced in the future?	Our LRFD Design aimed at the typical 75-year life with all reasonable and economical solutions such as increased top cover to the galvanized reinforcement, HPC precast deck under strict QC, PPC Overlay, and a hot-dipped galvanized prefabricated steel grid. One must also consider the existing steel which was left in place with a three-coat paint system, and the substructure that was rehabilitated, albeit 60 years old.
23	How was the transportation of these panels handled?	Primarily via trucks, and some via barge. The steel prefabricated grid was trucked from Bedford, PA to upstate NY, then precasting completed and again trucked back to Toms River or barged in.
24	Is it safe to assume that the concrete truck was only allowed on the composite deck during the closure pour?	Please see detailed response to question 20. Your assumption is correct.
25	Slide 33 - Was there a special provision or a standard spec for the PPC overlay? How thick?	Detailed specifications for the PPC were included and developed in close coordination with the manufacturers, with detailed steps for materials, tests mandated, surface preparation, application, finishing and grooving. We used a 3/4 inch-thick PPC.
26	Were there incentives/penalties in the contract?	Standard NJDOT derived liquidated damages were included, based on Road User cost, demand, season and mandated lane openings. Up to \$14,000/day cumulative LDs were included. NO incentives were included as three full seasonal closures of the Mathis bridge were allowed.
27	Why was the elastomeric pad not placed directly on the concrete?	The standard details in NJ utilize a steel masonry plate. And we were also making up the height difference by standardizing the steel risers for easy fabrication, and the steel bearing masonry plate helped not only better distribute the load over the existing rough concrete, but also helped standardize the risers. If the elastomeric pads were to be epoxied down to concrete, there is a concern on the significantly different coefficient of thermal expansion/contraction between concrete and epoxy, and could lead to failure at the interface.
28	Was a coating applied to the exposed WT bearing bars in this marine environment?	The entire grid system was hot-dipped galvanized for protection against the marine environment.
29	Was there any special prep for the closure pour bonding surfaces?	A thorough pressure wash followed by a special methyl-methacrylate bonding/surface crack sealer was applied prior to placing the PPC.

30	Barrier is made of Hollow Steel Sections which are known to corrode on the inside. Why did you use them and have you considered loss of section?	The steel barriers were only a temporary application and were removed after construction. The detail has a plate at the bottom that extends out and is flush with the roadway. The top is covered as well so water intrusion in the temporary application and corrosion were not a concern.
31	Any thought to eliminate some of the deck joints and make continuous deck?	Yes, indeed - a detailed study of the benefits, load distribution on the existing simple beams, additional load on the piers and piles, costs and benefits were studied. A link slab concept was also evaluated, but the cost of special mixes and the extent of such were, in our case, not beneficial. The original open deck joints were hence sealed with strip seals.
32	How does the orthotropic deck fare in extreme weather or freeze/thaw cycles?	If the question is for Exodermic decks, the freeze/thaw behavior is no different, and cold weather response is similar to a reinforced concrete deck, all others things being the same. We did not use the orthotropic deck system.