IDOT ACCELERATED BRIDGE CONSTRUCTION PILOT PROJECT – ILLINOIS ROUTE 115 OVER GAR CREEK IN KANKAKEE COUNTY

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In October 2017, the Illinois Department of Transportation (IDOT) completed its first total bridge replacement project implementing Accelerated Bridge Construction (ABC) techniques with a targeted road closure period of only 72 hours. Construction Contract 66B67 consisted of replacing the structure carrying IL Route 115 over Gar Creek in Kankakee County with ABC techniques to limit traffic disruption, avert a 30 mile detour on state routes, and/or avoid costly upgrades to local roads. The successful bidder for the project was Tobey's Construction and Cartage, Inc. (Tobey's). WHKS & Co. (WHKS) was retained by Tobey's to provide structural engineering design services for numerous components necessary for the ABC project. In addition, WHKS provided on-site field representation for Tobey's during the road closure period to aid in resolving any emerging structural issues in a timely manner thereby minimizing impacts to the ABC schedule.

Illinois 115 over Gar Creek

The project was financially assisted through the Federal Highway Administration's Accelerated Innovation Deployment program that provides funding and other resources to offset the risks of applying innovative techniques to infrastructure construction. Contract plans detailed a single span, wide flange beam replacement structure supported on semi-integral abutments. ABC concepts included in the contract plans consisted of constructing the superstructure on temporary bents adjacent to the existing bridge followed by installation of several precast concrete components during the road closure period and a lateral slide procedure to move the superstructure into final alignment.

Proposed Superstructure Constructed on Temporary Bents

The abutment caps, wingwalls, bridge approach slabs, and bridge approach slab footings were all precast concrete elements that significantly diminished the need for cast-in-place (CIP) concrete and extended time periods typically required for forming, casting, and curing CIP construction. The only “concrete” cast during the road closure was high early strength concrete to join the precast abutment caps and wingwalls to the driven piling and grout shear keys for the bridge approach slabs.

WHKS worked with Tobey’s to modify details in the contract plans for the temporary bents and abutments to ensure global stability and accommodate a hydraulically driven roller system capable of sliding the proposed superstructure approximately 41 feet into final alignment in less than one hour while controlling a tight tolerance on alignment and geometry. WHKS initiated additional modifications to precast abutment and approach slab details to simplify handling and prevent cracking during lifting, as well as improve the ability to grout the connection between the precast abutments and driven piles with high strength material.

Lateral Slide Progression

Precast Concrete Abutment Cap Being Lowered onto Piles

Precast Bridge Approach Slab Driving Lane Being Lifted

The pilot project was a success in that it illustrated that ABC techniques can be employed to complete such a project in significantly less time than conventional staged construction or full road closure and is expected to serve as an example for other projects. The project further highlighted possible

improvements for reducing the necessary time to complete a similar project in less than the targeted 72 hours and possibly as short as 48 hours. Valuable insight was gained with the pilot project regarding modifications to plan details and specifications that can aid contractors and help facilitate ABC concepts. While for such projects there is often significant emphasis placed on contractors for having contingencies for items such as equipment failure, the project highlighted that it is equally important for designers to have contingency plans for various components to help facilitate the ABC schedule in the event field problems are encountered.

The lateral slide was an essential component for facilitating the complete structure replacement within the 72 hours of complete road closure. While the lateral slide was one of the highlights of the project, it is important to acknowledge the amount of time required for all other ancillary work to be completed within the 72 hours including structure demolition, pile driving, setting of precast elements, riprap placement, backfilling, asphalt placement, and guardrail installation. WHKS and Tobey's sought and succeeded in improving conceptual lateral slide details shown in the contract plans by using hydraulic powered rollers and detailing temporary support bents and precast abutments such that the lateral slide consumed very little time. This was important in ensuring there was ample time available for completing all of the other all of the other above mentioned activities required to be completed within the 72 hour timeframe.

Completed Project