2017 â?? Bridge 1-438 on N463 Blackbird Station Road over Blackbird Creek

Description

Meta Fields

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Project Summary : The replacement of Bridge 1-438 on Blackbird Station Road over Blackbird Creek implements several Accelerated Bridge Construction (ABC) Techniques. The 50â??-0â?• single span beam bridge acts as Delawareâ??s first all precast bridge and incorporates the nationâ??s second Ultra High Performance Concrete (UHPC) overlay. The construction of the new bridge provided what The Delaware Department of Transportation (DelDOT) expects to be a maintenance-free solution for the next 100 years. The Department is committed to implementing new and innovative bridge replacement techniques that will decrease construction times, increase commuter and work zone safety, and minimize user costs due to the decreased road closure duration. Bridge 1-438 serves as the pilot project for several new ABC techniques both in Delaware and the United States. This project also serves as a great example of the collaborative efforts between federal and state agencies in producing specifications and plans for ABC techniques.
Project Location : Blackbird Station Road over Blackbird Creek south of the town of Townsend
Mobility Impact Time :

- ABC: 1 Month
- Conventional: 3 Months

Impact Category : Tier 4 (within 1 month)
Dimensions : 50-ft-long single-span concrete adjacent box beams resting on stub abutments supported by prestressed concrete piles
Average Daily Traffic At Time Of Construction : 1145
Traffic Management : extended use of the 4.5 mile detour route
Existing Bridge Description : The existing bridge consisted of two 7â??-0â?• x 10â??-8â?• corrugated metal pipe arches. The existing bridge experienced severe corrosion at the water line and loss of fill around the pipes.
Replacement Or New Bridge : Bridge 1-438 utlizes 50-ft-long precast prestressed concrete piles, 46-ft-long precast abutments, precast wingwalls, 24" x 48" precast adjacent box beams, and prefabricated steel bridge rails, making it the first bridge in the state of Delaware to be constructed entirely of prefabricated bridge elements. The bridge also uses Ultra-High-Performance Concrete (UHPC) transverse connections between adjacent beams and as an overlay.
Construction Method : Soil conditions at the project site lent themselves very well to the use of precast prestressed concrete piles. A single row of six plumb piles were used to support the abutments on each side of the bridge. The piles were 14â?•x14â?•, with the production piles being 45â??-0â?• long. Because of the precast abutments, tighter tolerances were required on the piles in order to ensure proper fit-up. DelDOT specifications normally require a 3â?• tolerance in any direction, but for this project, the tolerance of the piles was tightened to 2â?• in any direction. In order to accommodate the tolerance and achieve proper pile spacing, the contractor erected a robust steel template that could be disassembled and used on future projects. All twelve piles were driven to a depth of approximately 37 feet into a dense sand layer and achieved a capacity of around 400 kips per pile. For this project, DelDOT chose to fabricate the test piles and production piles simultaneously instead of waiting to establish the driving criteria before casting the production piles. This choice allowed the contractor to immediately drive production piles after the test piles were driven and the Department had established the driving criteria. This approach is common practice on smaller DelDOT bridge projects where there is a high level of confidence in the subsurface conditions, and results in several weeks of time savings. The pile driving took roughly six hours per side to complete and was finished in two consecutive days. Once the precast piles were set, the contractor spent two days preparing the channel under the bridge and grading the subbase for the placement of the abutments. The proper placement of the precast prestressed piles was vital to the overall success of the project and allowed for the rapid erection of the precast abutment sections. Typical practice on previous DelDOT projects has been to cast bridge abutments in place. This requires a large amount of time to place and tie rebar, build formwork, pour the concrete, and allow the concrete to cure. Bridge 1-438â??s substructure consists of two 46â??-0â?• long precast concrete variable height stub abutments. Two separate sections were cast for each abutment. Each section creates an overlapping joint in the center of the assembled abutment. The

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