

Ohio County Accelerates Cost-Effective Bridge Replacements with Steel

As part of an ongoing county-wide bridge replacement program, Ohio's Muskingum County Engineer's Office (MCEO) initiated the replacement of the structurally deficient Boggs Road Bridge in Perry Township, east of Zanesville, Ohio.

The original 33-foot Boggs Road Bridge, constructed in the 1950s, had begun to show signs of deterioration and MCEO had already imposed weight limits. As a common practice, MCEO performed a detailed engineering analysis to compare the cost of replacing the existing bridge with steel or concrete.

Douglas R. Davis, P.E., P.S., County Engineer for MCEO, said, "For this project, we compared the cost of five galvanized steel beams with the cost of six concrete box beams which were needed to replace the short span bridge superstructure. The galvanized steel beams saved us more than \$10,000. Since local crews would not need a crane to set 1.5-ton steel beams, which would be necessary for 17-ton box beams, we realized significant additional savings on materials and equipment rental. Added to the lower cost of materials and equipment, we also secured a 35-year warranty on the galvanized coating system and the ability to rehabilitate the steel in the future. The engineering analysis showed that steel was the best choice."

With an eye on completing the bridge replacement as quickly as possible, MCEO initiated the detailed bridge design.



County Engineer Doug Davis says the galvanized steel beams saved MCEO more than \$10,000.

Fast-Track Design

For the Boggs Road Bridge replacement, the in-house engineering team designed a 24-foot wide steel beam structure constructed of five beam lines, five-feet on center covered with a nine-inch-thick cast-in-place composite concrete reinforced deck with no skew, placed on new concrete abutments with spread footings. The team saved significant time and costs by planning and designing the structure in-house.

Local Crew Edge

With the design in hand, MCEO let bids for the bridge elements. The Boggs Road Bridge superstructure was fabricated by U.S. Bridge in Cambridge, Ohio with five W24x76 ASTM A709 GR 50 beams and laterally supported with C12x25 braces. The superstructure was hot-dip galvanized prior to delivery.

On May 20, 2014, MCEO crews began the removal and replacement of the bridge. The superstructure was erected on reinforced concrete abutments on spread footings. Steel I.5C decking (manufactured by Nucor) was installed as stay-in-place forming for the main deck area and then shear studs were installed through the decking. Then, crews used a county-designed forming system made up of W8x18 steel beams supported by the exterior beam to support the thickened 18-inch-thick deck edge, work walkway and work bridge. Guardrail inserts were installed in the thickened deck edge prior to the installation of two mats of epoxy-coated Grade 60 reinforcing steel. Crews then poured a 4,500 psi crowned concrete deck with IPANEX® waterproofing admixture.



Local crews using equipment and tools already on hand saved significant time and costs on this project.

"Our ability to handle, fabricate, repair and construct steel beam structures with equipment and tools we have on hand saves considerable time and money that we would ordinarily have to spend hiring a contractor," confirmed Davis.

The Boggs Road Bridge reopened on June 20, 2014.

Long-Term Steel Focus

Muskingum County has relied on steel for many years. Today, approximately 60% of the county's 415 bridges are steel. There are 42 steel truss bridges (one built in 1913), three steel girders, 186 steel beam bridges and 19 steel culverts.

Davis said, "We've found that steel is strong and economical for our typical span lengths. Steel is easy to fabricate and construct, and its strength-to-weight ratio allows us to erect most of the structures without the use of a crane. Steel is also easy to maintain and repair, which promotes the longevity of our structures. And finally, steel is recyclable and reusable. We have reused/repurposed several structures in other locations, saving tens of thousands of dollars. The cost savings of steel versus other materials coupled with the other advantages of sustainability and easy maintenance means that we can repair and replace more bridge structures and shorten road closures."

Quality and sustainability were also factored into the choice of steel for the Boggs Road Bridge. Steel beams are fabricated in a highly controlled process as compared to concrete that is poured by outside in varying weather conditions. MCEO also likes the fact that it can maintain and reuse steel bridge beams.



The completed Boggs Road Bridge. Steel provided MCEO with a cost-effective, durable and sustainable project solution.

Davis says that MCEO will consider using the Short Span Steel Bridge Alliance's (SSSBA) free, web-based short span steel bridge design tool, eSPAN I 40, for future projects as a way to further accelerate and simplify steel bridge design and construction in the county. He adds, "We weren't familiar with eSPAN I 40 prior to the Boggs Road project, but we welcome the opportunity to call on the SSSBA's resources to support our staff when needed and to benchmark our future designs."

eSPAN I 40, which delivers customized short span steel bridge preliminary designs in less than five minutes, can be accessed at www.eSPAN I 40.com.

About the Short Span Steel Bridge Alliance

The SSSBA provides essential information to bridge owners and designers on the unique benefits, innovative designs, cost-competitiveness and performance related to using steel in short span installations up to 140-feet in length. SSSBA partners comprise bridge industry leaders, including steel manufacturers, fabricators, designers, fasteners, service centers, coaters, researchers and representatives of related associations and government organizations. For news or information, visit www.ShortSpanSteelBridges.org or follow us on Twitter @ShortSpanSteel.

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