Route 76 Bridge over Lake Taneycomo

by Thomas P. Lohman, Horner & Shifrin Inc.

Photo of the completed bridge. All photos: Kevin Skibiski, Horner & Shifrin.

The Route 76 Bridge over Lake Taneycomo in Branson, Mo., is the longest and oldest spandrel-arch bridge in Missouri and is generally recognized as one of the state's most notable structures. The Branson area is a popular vacation destination with an estimated 8 million visitors annually and 20,000 vehicles crossing the bridge daily. Consequently, the importance of limiting road closure during construction was paramount. Additionally, the historic significance of the bridge required that bridge preservation, rather than bridge replacement, be employed.

Built in 1931, this structure is 1085 ft long and connects the cities of Branson and Hollister. The bridge consists of five 195-ft-long reinforced concrete open spandrel arch spans with concrete deck girder approach spans. The deck and spandrel beams of the arch spans were severely deteriorated and needed replacement. The existing spandrel columns were to remain in place.

Early in the design phase, it became apparent that accelerated construction was necessary to minimize traffic impacts. Many options were explored including the use of precast concrete spandrel beams, precast concrete deck panels, and combinations of the two. Local precast concrete fabricators were consulted to determine their capabilities and preferences. Based on those discussions, two innovative uses of precast concrete were developed: precast, reinforced concrete spandrel beams and partial-depth, precast, prestressed concrete deck panels.

Existing concrete spandrel beams were spaced at 10.5 ft along the length of the arch spans. The existing beams were cast on concrete spandrel columns that carry the load to the arches. To speed and simplify construction, new precast, reinforced concrete spandrel beams were used. The beams had pockets cast in them to allow the existing column reinforcement to be re-used in the connection detail.

Spandrel beams were set on a bed of epoxy on top of the existing columns. The epoxy acted both as a leveling pad and joint sealant around the exterior of the reinforced connection. The pockets were then filled with grout. Once the process was mastered, the contractor was able to complete the work quickly, saving months of construction time.

Challenges included casting the grout pockets and handling the beams because of the reduced cross section at the grout pockets. Ninety-five beams were required, each approximately 32 ft long with a 2-ft-square cross section. The tops of the beams were sloped 2% transverse to the roadway to provide a better fit-up of the partial depth, precast, prestressed concrete deck panels.

Missouri has used partial-depth, precast, prestressed concrete deck panels as their standard method of deck construction for slab-on-girder bridges for many years. This project required the main reinforcement to be parallel to traffic on the spandrel arch spans, not transverse to traffic as is the case for more traditional slab-on-girder construction methods. This required a special design for over 30,000 ft^2 of 3.5-in.-thick panels, but the shape and materials of the standard panels were maintained, allowing the fabricator to use forms and materials already available. The panels were made composite with a 5.5-in.-thick, cast-in-place concrete deck.

The use of precast concrete allowed for accelerated construction, saving the contractor months of construction time. In addition to these time savings, the elements fit together so smoothly that the bridge was re-opened more than one month ahead of schedule.

The bridge was recognized as the Best Rehabilitated Bridge in the 2012 PCI Design Awards.

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Precast spandrel beams were placed on top of the existing columns.