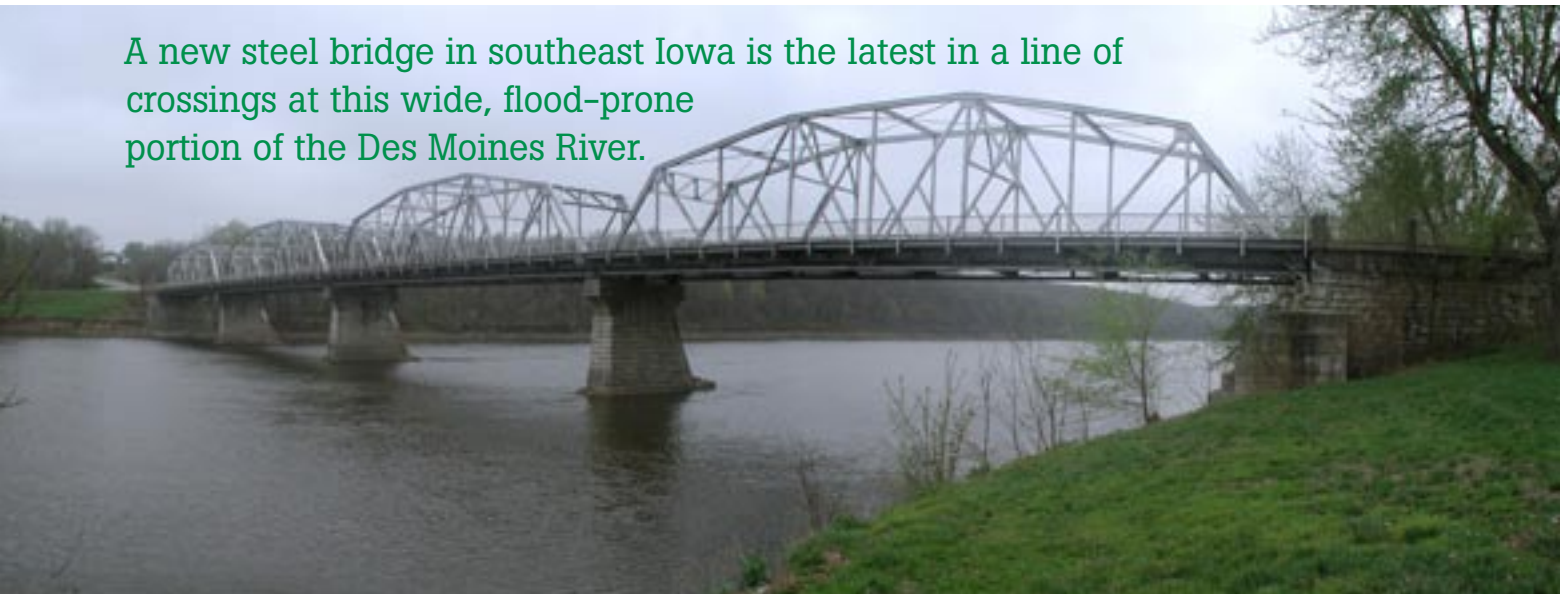


Wide River

BY STUART S. NIELSEN, P.E.

A new steel bridge in southeast Iowa is the latest in a line of crossings at this wide, flood-prone portion of the Des Moines River.



The iconic 1930s bridge, which the new Keosauqua bridge replaces, cost a mere \$86,000.

Photos: Courtesy of Iowa DOT



The new bridge is 680 ft, a bit longer than its 614-ft predecessor above.

THE FIRST ATTEMPT to bridge the wide Des Moines River near the picturesque town of Keosauqua, in southeast Iowa, commenced in 1850. But the project was abandoned in 1851 when a portion of the wooden span fell into the river. (A ferry was used to cross the river prior to and following the bridge's construction and demise.)

In February 1873, the Van Buren County Supervisors contracted with the Wrought Iron Bridge Company of Canton, Ohio to initiate construction of a major wagon bridge over the river at Keosauqua. This bridge fared better than its predecessor and was completed by that fall. The four-span, bow-string arch bridge featured three limestone piers, a wooden plank deck, and a posted sign that read: "Eight dollars fine for riding or driving faster than a walk across bridge." The bridge performed well for 65 years but eventually outlived its usefulness, proving too narrow for more modern vehicles and heavier loads.

In 1938, the Iowa State Highway Commission designed a new bridge, using the original (widened) stone abutments and piers of the 1873-built structure. Modern for its time, the steel truss bridge consisted of a 24-ft-wide roadway and two 5-ft-wide cantilevered sidewalks. The structure was completed in 1939 at a cost of \$86,141. The 1,039 trusses were technologically significant for their uncommon Warren web configuration. It is not known how many bridges of this design were built in Iowa, but the Keosauqua bridge is the only known polygonal-chorded Warren, and as a result was named to the National Historic Register in 1998.

The 1939-built bridge lasted longer than both of its predecessors but in early 2003, it was determined that the



The bridge includes a 32-ft-wide roadway, a 5-ft-wide sidewalk, and a 10-ft-wide bicycle path.

structural integrity of the truss was rapidly declining. Hence, a new Keosauqua bridge would have to be built.

Detour not an Option

For a typical bridge replacement, an engineer can theoretically design a new structure without leaving the confines of his or her office. But this wasn't an option for the Keosauqua crossing because of the bridge's historic value and unique surroundings. Designers for the new bridge spent a great deal of time on-site to get a feel for the local landscape and the historical significance of the crossing. The 1939 structure was located in the heart of Keosauqua and provided a path across the river to the 1,653-acre Lacey Keosauqua State Park, one of Iowa's largest state parks and a year-round destination for tourists. It had survived numerous floods and was considered one of the scenic high points for those paddling on the river.

The first step in the process of replacing the truss bridge was meeting with the citizens of Keosauqua. The Iowa Department of Transportation (IDOT) held a series of town meetings to gauge the needs and desires for the new bridge. Aesthetics was high on the list of concerns but other issues, such as traffic staging, also had a major impact on the concepts for the new bridge. From a practicality standpoint, closing the existing bridge's roadway would have required a 22-mile detour and was therefore deemed unacceptable. Besides creating a major inconvenience for motorists, cross-river access via the bridge was required for school buses and emergency vehicles.

A bridge committee of local citizens and officials was formed to help guide the design of the new bridge and eventually decided on a girder-style bridge. While this would be the easiest style of bridge to stage, it was quite a change for the residents to go from a towering, above-deck structure to a lower, more subdued design.

Three Spans

A three-span variable-depth weathering steel girder bridge was chosen for the replacement. The first stage was built along side of the existing truss bridge, using a three-girder cross section, allowing the existing truss to carry traffic. This also had the benefit of allowing residents to view the construction of the new bridge from the sidewalk of the old bridge.

Two lanes of traffic were then placed on the new bridge, the old bridge was demolished, and then the new bridge was widened to its final width by adding an additional two girders. This scenario allowed for two lanes of traffic to flow for the majority of the construction period, easing concerns of long traffic detours.

The new Keosauqua bridge has a five-girder cross-section, spaced at 11 ft, 7 in., with two 210-ft end spans and a 260-ft center span, making the new bridge 680 ft long in all, slightly longer than the 614-ft truss bridge. A 32-ft-wide roadway was chosen to reduce costs and help with traffic calming of vehicles coming down from a hill on the south end of the bridge. The bridge also features a 5-ft sidewalk and a 10-ft-wide bike path.

The welded plate girders range in depth from 6 ft at the center of the spans to close to 12 ft at the piers. Fabricated by the Stupp Bridge Company in Bowling Green, Ky., they were shipped by truck in 120-ft segments to the bridge site. More than 800 tons of struc-

tural steel was used in the construction of the bridge.

Aesthetic features of the bridge include two overlooks on the east side of the bridge, custom railings, and dramatic piers. The piers and abutments use form liners to mimic limestone and were painted using high-quality stains. Stones rescued from the limestone piers of the old truss bridge top the new pier towers, allowing visitors to actually reach out and touch the past. In fact, the old limestone piers were also reused as revetment to dress the shoreline around the new abutments.

The design team received a "Best Practices in Context-Sensitive Solutions, Notable Practice" award from the American Association of State Highway and Transportation Officials (AASHTO) in 2006 for the project. Construction was completed last fall. **MSC**

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Bridge Designer

Iowa Department of Transportation, Office of Bridges and Structures

Steel Fabricator

Stupp Bridge Company, Bowling Green, Ky. (AISC/NSBA Member)



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