**Prodigious Picks**

Custom gantry places 97-ton County Materials bridge beams steps from normal interstate traffic

A Jane Addams Memorial Tollway/Interstate 90 contractor capped the 2014 season with the first phase of prestressed concrete erection for the $95 million Fox River Bridge expansion—24 bulb tee girders, 90-in. deep, 150- to 168.5-ft. long—and proved how a proprietary hoisting scheme can replace conventional crane picks without disrupting immediately adjacent highway traffic.

Plain, Wis.-based heavy/civil contractor Edward Kraemer & Sons Inc. devised twin gantries, each with a) one leg bearing on an existing structure of concrete deck, legacy prestressed concrete I girder and cast-in-place pier design; b) the other leg mounted on new piers widening the Fox River/I-90 crossing from six to eight lanes.

First girder phase staging at the Elgin, Ill., site saw Kraemer crews position the 80-ft. long, 11-ft. wide and 27-ft. tall gantries 150–170 feet apart, depending on beam length. Each frame is designed with an 11-ft., cross-braced column on both ends to bear overhead trusses carrying two, 50-ton hoists and trolley. The gantries hoisted the deep bulb tees from trailers loaded at the new County Materials Corp. precast/prestressed operation in Janesville, Wis. The producer’s contract covers 144 beams; over 2014-16 phases, they will be placed in four 170-ft., two 150-ft. and two 164-ft. spans—nine girders across twin structures bearing eastbound and westbound lanes.

Once the initial beams were set at the east approach, Kraemer crews disassembled the gantry frame and moved it to the next open pier. They continued the sequence across seven piers serving new eastbound lanes and will repeat the process in mid-2015 for westbound lanes bearing on new cast-in-place piers. A 2014-16 window will see a new Fox River Bridge engulf the original structure, whose demolition is phased such that three lanes of traffic in each direction can be maintained nearly 100 percent of the time.

Initial girder erection work proceeded without having to close any I-90 lanes, a convenience cranes staged on the existing bridge would not have afforded. Kraemer positioned a standard height concrete barrier to separate eastbound traffic—flowing at or near normal speed—from the gantry, trailer and girder staging area.

In addition to placement at a pace matching what could be attained with multiple, large cranes, the gantry scheme enables Kraemer to deliver the new Fox River Bridge with a single longitudinal joint versus three on the original structure. Such streamlining is a critical engineering detail for Illinois Tollway, an agency wise to maintenance costs and traffic disruption attributable to continuous bridge deck openings.

Elimination of two longitudinal joints will net an incentive for Kraemer, which is handling abutment-to-abutment work as a member of lead contractor, Kenney Kraemer Joint Venture. Illinois Tollway has engineered the project in house and retained Oak Park, Ill.-based Thomas Engineering Group as construction manager.

Continued on page 64
The gantry scheme proved its mettle during the first prestressed girders erection phase (eastbound structure, outer lanes). Each main frame is shifted after a row of beams is placed on new piers. Ed Kraemer & Sons configured the gantry to bear equally on the existing structure and new pier, the latter via a temporary bracing and mounting assembly (above). The method limits primary lifting requirements to one main crane; more importantly, it enables a girders erection sequence between new eastbound and westbound structures such that the finished bridge will have one longitudinal joint instead of three on the original crossing.

Crews engage girders for hoisting by threading lifting plates through top flanges, securing them with six bolts near the web midpoint. County Materials is fabricating the 150- to 168.5-ft. bulb tees to Kraemer’s lifting-hardware specs and with up to 50 0.6-in. diameter prestressing strand, 22 draped.

PHOTOS: Illinois Tollway
CUSTOMER SERVICE

Ed Kraemer & Sons’ motorist-friendly plan was noted up the chain from the Illinois State Toll Highway Authority. Upon announcement of the gantry scheme weeks before the first girder erection phase, then-Illinois Governor Pat Quinn observed, “This technology will help the Tollway complete this major project on schedule without disrupting the thousands of drivers who use this bridge every day. We are committed to rebuilding and improving these vital roadways to help our residents travel more easily and our businesses ship their products more efficiently.”

“The advanced building techniques and equipment the Tollway is using to complete this crucial project illustrate how we are always looking for new ways to improve our road system,” added Toll Authority Executive Director Kristi Lafleur. “Innovation helps us complete challenging construction work more quickly, which saves time and reduces costs.”

The new bridge will have side-by-side 1,315-ft.-long structures rising 40 feet above the water and adjacent roadways. With eight spans and seven piers—versus the original structure’s 14 piers—each crossing will reduce the environmental impact on the waterway and forested fen below. The Fox River Bridge has average daily volume just over 100,000 vehicles.

The Fox River Bridge was constructed in the 1950s as part of the original Tollway system. The Kenney Kraemer J.V. undertaking is part of the $2.5 billion Jane Addams Memorial Tollway Rebuilding and Widening Project, funded by the 15-year, $12 billion “Move Illinois: The Illinois Tollway Driving the Future” capital program. The Jane Addams/I-90 upgrade will deliver what Illinois Tollway officials describe as a 21st century, state-of-the-art corridor linking Rockford, Ill., to O’Hare International Airport.

With calculations and drawing assistance from Westbrook Engineering of Spring Green, Wis., Ed Kraemer & Sons designed and fabricated the mobile structures at its Plain, Wis., headquarters shop. The gantry scheme displaces two additional large-capacity cranes and the costly shoring they would have required under the bridge.

The gantry’s trailer-to-pier girder transfer window is comparable to what Kraemer estimates conventional lifting equipment would have entailed. Specialized, six-bolt picking plates at the beam end points require limited time for crews to engage hoists. The devices have to be placed into the prestressed concrete member prior to pulling underneath the gantry system and then positioning travelers over the girder.

Air-driven trolley systems bearing like-powered 50-ton chain hoists run on the upper gantry frame and travel using geared drive wheels. Operators control hoist raising and lowering, plus trolley travel, with thin gauge cables. One operator is needed for each trolley/hoist combination. Two trolleys and hoists are used at each pier location with a distribution beam in between. The configuration is necessary to utilize one gantry design without augmenting the system for variable pier cap widths or moving the trolleys from one side of the gantry frame to the other, depending on which span crews are picking. A total of five operators are enlisted in beam erection—four for the hoists/trolleys and one for placing picking devices.
The new Fox River Bridge will be side-by-side 1,315-ft.-long structures rising 40 feet above the waterway. Work began with construction of two 200-ft. platforms in the Fox River under the bridge. They are about 185 feet from each bank, leaving a 180-ft. gap for river flow. The platforms are constructed with sheet piling on four sides driven deep into the bed of the river then filled with 3-in. rocks, forming a platform base which is used to move equipment for pier casting.

The eastbound structure’s new portion—shown here from the east approach (right) and west bank (top)—will allow for three lanes of traffic in each direction to be shifted from the westbound to the eastbound bridge in 2015, while the former is rebuilt and widened. The eastbound structure’s remaining (center) portion will be reconstructed in 2016.

The new Fox River Bridge is emerging as a showcase of new versus old prestressed concrete engineering, where modern bulb tees more than 7 feet deep and nearly 170 feet long succeed vintage I girders of half the depth and length, and enable a reduction of piers from 14 to seven.