

PROJECT SPOTLIGHT



County Materials manufactured the prestressed concrete bulb-tee girders for these side-by-side four-lane bridges. The bridges replaced the previous six-lane bridge over the Fox River on Interstate 90 in Elgin, Ill., as part of a highway widening project. Courtesy of Illinois Tollway Construction Manager, TEG.

Bridge for highway widening progresses smoothly thanks to precast concrete girders

Replacing the Fox River Bridge in Elgin, Ill., was part of the rebuilding and widening of the Interstate 90 (I-90) Jane Addams Memorial Tollway. Originally opened in 1958, the six-lane bridge has been replaced with two 1315 ft (400.8 m) long side-by-side four-lane bridges that stand 40 ft (12 m) above the Fox River.

Maintaining traffic flow while simultaneously demolishing an existing bridge and building a new one is traditionally accomplished by developing a multistage plan that requires the jockeying of traffic back and forth across the bridge with split counterflow lanes.

However, by installing precast concrete girders that increased the structural depth of the bridge, it became possible to construct the entire substructure of the new bridges underneath the existing bridge, significantly reducing the impact to traffic and allowing construction of the new substructure without interruption, even through winter.

Janesville, Wis.-based County Materials was selected to manufacture the 144 prestressed concrete bulb-tee girders, which are 168 ft (51.2 m) long and 90 in. (2300 mm) high.

These extra-large girders reduced the number of piers that were required, which not only was an economical design feature (including the fact that there will be fewer joints requiring maintenance), but also helps to minimize environmental impact on the Fox River.



The substructure of the Interstate 90 bridge over the Fox River in Elgin was constructed under the existing bridge. Courtesy of Scott Eshleman.

The girders were the largest that County Materials had produced to date. Up to fifty 0.6 in. (15 mm) diameter strands, including 22 draped strands per girder, were pulled to 44 kip (196 kN) each, requiring a total pull of 2.2 million lb (9800 kN) of force before being encased in 8000 psi (55 MPa) concrete to achieve a unit that will hold up to the stress of bearing the weight of approximately 100,000 vehicles a day. To accommodate this unusually high tension, the manufacturing crew used special high-strength rods and restraining devices, as well as special hold-up frames.

The girders were transported at a maximum of 45 mph (72 km/hr) during daylight hours only, accompanied by two escort vehicles. "Getting them to the jobsite safely was as important as making them," says Andy Keenan, prestressed bridge representative for County Materials. "We paid attention to little details like holding them down to trailers with web through holes and using expert drivers."

Once on-site, a gantry system—used instead of conventional cranes to perform heavy lifting—was utilized to lift and set the heavy girders, each weighing nearly 100 tons (890 kN). “The gantry system allowed delivery trucks to pull under the gantry system to offload their cargo,” says Scott Eshleman, structural department manager for Chicago, Ill.-based Stanley Consultants, the consulting engineer for the project. “A trolley at the top of the gantry then hoisted the offloaded girder into the air, rolled it out over the new pier units, and deposited it into its final resting position.” Three gantry structures were then leapfrogged from pier to pier to allow all girders to be placed by this system.

The project, which took place between 2014 and 2016, was such a success that it won the Eminent Conceptor Award in the Engineering Excellence Awards competition sponsored by the American Council of Engineering Companies of Illinois. —William Atkinson

Heldenfels opens third Texas plant to supply beams for 21-bridge highway project

In early 2015, Heldenfels Enterprises Inc. of San Marcos, Tex., built a new prestressed concrete plant in El Paso, its third in Texas (the other two being in San Marcos and Corpus Christi). All three plants are PCI certified.

The main reason for building the plant was to be able to begin production on about 1300 precast concrete beams for the 21 bridges that are part of the state’s design-build 9 mi (14 km) Loop 375 Border Highway West extension project in El Paso that is being built by the Abrams-Kiewit Joint Venture.

The plant is planned to be permanent and has worked on more than the highway extension project. “We have also sought out and won bids on other projects since,” says Fred Heldenfels IV, president and CEO of Heldenfels Enterprises.

The Loop 375 project begins at US Route 54 and is designed to provide an alternative east-west route to Interstate 10 in order to accommodate the projected growth in traffic, and, at the same time, complete the east-west travel corridor through the El Paso metropolitan district. The project also includes an option to develop an anti-icing system that would automatically treat the Loop 375 bridges and Loop 375 direct connector bridges.

The project design called for prestressed concrete beams of varying depths, not spaced greater than 9 ft (8 m) apart. The beams that Heldenfels is manufacturing for the bridges are the Texas Department of Transportation’s TX girder cross sections. “These were mostly TX-70 beams, about 90%, but there were some TX-54s,” Heldenfels says.



Heldenfels Enterprises Inc. opened a new prestressed concrete plant in El Paso, Tex., to help supply beams for the Loop 375 Border Highway West extension project, which includes 21 bridges. Courtesy of Heldenfels.

The bridges also use steel girder beams with concrete barriers down the middles of the structures and F-shaped barriers along the slab edges. The substructure uses a rectangular bent-cap shape, and the rectangular columns incorporate a pedestal and capital, improving the aesthetics of the bridges.

The mixture for the self-consolidating concrete used in the construction of the precast concrete beams includes 560 lb (2500 N) of cement, 140 lb (620 N) of fly ash, 1500 lb (6700 N) of sand, 1557 lb (6926 N) of a ¾ to ⅝ in. (19 to 9.5 mm) blend coarse aggregate, and 227 gal. (859 L) of water, plus 52 oz. (1500 mL) of admixtures.

Heldenfels began production of the precast concrete beams in August 2015 and delivered the first beams to a bridge on the project in December 2015.

The project initially called for more than 172,000 ft (52,400 m) of prestressed concrete beams. However, significant delays in the completion of, and subsequent changes to, the bridge designs by the design-build joint venture’s consulting engineers reduced the total quantity required to 146,000 ft (44,500 m).

As of the end of March, Heldenfels’s production and delivery of beams for the projects were about 62% complete. Production should be complete by Thanksgiving, with the final six to seven spans being delivered in the first quarter of 2018.

—William Atkinson ■