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McHugh Building Arch Bridge Over Fox River

Challenging bridge project is key part of Illinois Tollway's Reagan Memorial Tollway (I-88) Rebuild & Widen Project

Story and photos By Tom Hale -- Construction Digest, 9/22/2008

James McHugh Construction Co. enjoys unique and challenging projects. That's why the Chicago-based general contracting, construction management and consulting firm is thrilled to be building a spectacular, 10-span arch bridge over the Fox River on the Reagan Memorial Tollway (I-88) in North Aurora, IL.

"We're very excited. We had been tracking and targeting the job for a long time," says Mike Gould, vice president of infrastructure for McHugh. "There aren't a lot of arch bridges being built in the country, and this is the biggest arch bridge we have seen in this area."

The Fox River Bridge project is a key part of the Illinois Tollway's Reagan Memorial Tollway (I-88) Rebuild & Widen Project, which is widening I-88 from two lanes to three lanes in each direction between the Aurora Toll Plaza and Orchard Road. This program is scheduled for completion by the end of 2009.

Scheduled for completion in December 2008, the new Fox River Bridge will increase capacity on I-88 to three lanes in each direction. Currently, the existing bridge, an arch bridge which opened in 1958, carries two lanes in each direction. The new bridge will carry three lanes of eastbound traffic, and the existing structure will carry three lanes of westbound traffic.

McHugh is serving as team leader for the new eastbound bridge, under a \$44.5-million contract with the Illinois Tollway to construct the new bridge and improve several adjacent overpass and ramp structures. Indianapolis-based **Janssen & Spaans Engineering Inc.** and Bowman, Barrett & Associates Inc., Chicago, are the designers of record.

The new Fox River Bridge will be 1,345 feet long and supported by 10 spans underneath the roadway, including a series of five, 178-foot-long arch spans to replicate the design of the existing bridge – the only arch bridge in the Tollway's 286-mile system.

The new bridge mirrors the existing structure's shape, "but it is a wider bridge – approximately 75 feet wide – to accommodate the Tollway's current standards for shoulders and lane widths," Gould says.

According to Gould, the Tollway's new bridge is also similar in concept to Cleveland's new 1,583-foot-long Fulton Road Bridge, a \$45.9-million open spandrel deck arch bridge project that is taking shape over the Cleveland Metroparks Zoo. "The arch elements are somewhat similar, but we have modified them quite a bit," says Gould. "That bridge has three pieces (each arch rib has three arch segments placed end-to-end) and this one has two. Also, that bridge is post-tensioned, whereas we are conventionally reinforcing this arch structure."

The new Fox River Bridge features nine piers, including two in the Fox River and one on an island in the middle of the river. The substructure includes 28 drilled caissons, with 16 on the river and 12 on the shore. Each caisson measured 6 feet in diameter and was socketed into solid rock at depths up to 28 feet.

A Top Project

Mike Gould, a 22-year construction veteran (13 years with McHugh), ranks the new Fox River Bridge "right at the top of the list" of projects McHugh has tackled. "This project requires construction and engineering ingenuity with the arch spans, the sizes of the elements, and the challenges in the river," he says.

Construction of the bridge began in October 2007, and the project is now more than 70 percent complete. During a July visit by Construction Digest, the arches were in place and workers were setting the bridge's beams. The arch spans are topped by 36-inch-deep, precast, prestressed (PPC) concrete beams. The other five spans use conventional 42- and 54-inch PPC beams.

Future work on the bridge includes concrete decking. "There are over 130,000 square feet of decking on this project between the arch bridge and our other two structures," Gould says.

McHugh's contract also includes construction of two smaller bridges west of the Fox River and additional infrastructure work. McHugh is rebuilding the IL Route 31 bridge over I-88 and building a new span over I-88 to support two Route 31 interchange westbound ramps. The IL 31 bridge will be a 234-foot-long, steel girder, two-span structure. For the Tollway's westbound IL 31 entrance and exit ramps, McHugh is building a 185-foot-long, two-span PPC bridge.

In addition, McHugh has been busy constructing more than 3 miles of temporary roadway, reconstructing more than a mile of roadway and building a 5-acre storm water retention site.

The contractor has been pleased with its construction operations. "The project has gone smoothly," says McHugh Senior Project Manager Joe Bodzioch, P.E. "We bid this job back in May 2007, but we probably spent four months before the bid to come up with our design concept and our design proposal. Once we did get the bid, there were another four to five months of preparation work to complete the final construction designs."

Project Challenges

In preparing for the project, McHugh was aware that the job would present a number of interesting challenges, and it certainly has lived up to its expectations. On land, the project team has had to accommodate industrial traffic along IL 25 by reconstructing portions of the highway and relocating several roads.

Working in an area that had been devoted to industrial use for more than 100 years created its own set of issues. The team demolished two old gas buildings on the site, unearthed unmapped utilities more than a century old, and uncovered slag chunks, legacy of a gold and silver leaching plant that stood on the east bank of the river.

In addition, the project has required working around a number of existing businesses, an active railroad track, and a portion of the Fox River Trail bicycle path.

Of course, a major challenge has been building in the Fox River. The new bridge spans the river, which is not navigable where the bridge crosses, but is still subject to strong currents and rapid water flows. In fact, historic fall, spring and early summer rains have posed additional challenges.



The new Fox River Bridge will be supported by 10 spans underneath the roadway, including a series of five, 178-foot-long arch spans to replicate the design of the existing bridge.

"The Fox River has been raging," says Bodzioch. "Since we started working on the bridge, the river flow has been above average. The river is finally coming down now, but its level is still above what it should be."

Under normal conditions, the river flows at approximately 500 to 700 cubic feet per second; it was measured at more than 6,000 cubic feet per second this year.

"Beginning last September and continuing throughout the winter, we also had problems with ice damming – the ice built up on the river and created a lot of force that moved a lot of things around," points out Bodzioch. "We actually had to rebuild our temporary bridge."

Even before the river began reaching historic levels and flows, the project presented challenges. The team had to maintain the river's flow while ensuring it could easily transport materials. This meant building temporary access structures, including a temporary bridge, to deliver materials and perform work.

"Construction of the causeways took almost 60 days during last fall," says Gould. "That work initially got us into the river to do foundations. Then, we expanded that operation dramatically when it came time to actually bring the arch pieces down to the river."

While working in and around the river, environmental standards had to be maintained, notes McHugh, meaning the team had to ensure that no construction materials or debris entered the waterway. Materials and support bases for cranes and other equipment had to be secured against fast-moving and rising waters. Finally, working on the river with active recreational uses meant that the team had to work around the occasional canoeist or kayaker.

Arch Segments

McHugh began initial foundation work on the new bridge in October 2007. "Then, we started precasting of the arches in November," Bodzioch says.

The cast-in-place concrete arches were fabricated at Geneva Construction Co.'s yard in North Aurora by McHugh, which is self-performing concrete work for the project. Each of the 40 precast arch segments weighs approximately 92 tons and is comprised of approximately 48 cubic yards of concrete using a 7,000-psi strength concrete mix created by Prairie Material.

Fabrication of the arch segments took place during December, January and February. The segments were trucked approximately 5 miles to the bridge site with special 90-foot, heavy-load semi-trailers, featuring 13 axles, rear steering and custom engineered swivel bolsters.

Transporting the arch pieces via area roadways was quite a feat. "We had to adjust traffic signals and street lights, and cut down tree limbs to get to the site, but it worked," Bodzioch says. The trucks could travel only 10 miles per hour, and each load was escorted by local police, Illinois State Police and contractor vehicles in order to control traffic during each transit.

Once on the project site, placement of the arch segments required a choreographed crane operation. "In order to maintain river flow and leave the (west) channel open, we devised a crane pick location plan that accommodated the erection of the arches," says Bodzioch. "We designed and built a temporary bridge to have access to the middle of the river."

The temporary bridge, capable of supporting a Manitowoc 2250 crane weighing nearly 1 million pounds, also carried the tractors and trailers transporting the 184,000-pound arch segments to the erection points. "Every pick was a critical pick," says Gould. "We had some good engineers on-site who monitored the crane, the location of the crane, and the location of each truck."

Constructing an arch bridge is tricky, since the structure is completely unstable until the two spans meet in the middle. "It is important to monitor the arches during the different phases as the loads come onto them because loads are being transferred through the arch elements in non-typical conditions," says Gould. "An arch bridge is a unique structure, so therefore there is a lot more engineering and monitoring that goes on during the different phases of the project. For example, we have a system set up where we survey each arch at more than half a dozen stages throughout the process – we are always aware of what the structure is doing as more load comes on to make sure it is functioning and acting properly."

About The Project Team

McHugh is overseeing a workforce of 80 to 90 on the Tollway project. "The project is quite busy with three bridges and roadwork ongoing," Gould says.

Key subcontractors and suppliers include Accurate Steel, Ambassador Steel, Aldridge Drilling, Aldridge Electric, Geneva Construction Co., Pat McNally Construction, PEC (Prestress Engineering Corp.), Industrial Steel Construction, Metropolitan Steel Erectors, Meyer Material Co., Prairie Material, RoadSafe Traffic Systems Inc., Alpine Demolition, and II In One Construction.

For McHugh, the veteran on-site team led by Joe Bodzioch includes Husam Arabi and Scott Morrison, assistant project managers; Tom Reidy, general superintendent; Joe Porter, superintendent; Karin Miller, office engineer; Deb Soldan, safety; and Brian Johnson, quality control.

"We have a great team," says Gould. "Joe (Bodzioch) has done a fabulous job leading this job and keeping the numerous public agencies and construction team informed." Bodzioch is constantly in touch with Illinois Tollway representatives, including Bob Jetter, resident engineer for the Tollway's construction manager, H.W. Lochner Inc., Chicago.

Bodzioch, a 16-year construction pro, says working on the project has been a good experience. "I've enjoyed it, and the Tollway has been wonderful to work with," he says. "It's been a challenge, but it's also been an opportunity to partner with a good design firm (Janssen & Spaans). I have probably done more thinking on this job than any other because of all its components. Thankfully the contract allowed us to break the design into multiple projects to keep construction moving forward."

McHugh and the Illinois Tollway are coordinating closely with a dozen governing bodies and agencies: Illinois Department of Transportation, village of North Aurora, city of Aurora, Burlington Northern Santa Fe Railroad, Illinois Commerce Commission, Fox Valley Park District, Fox Metro Sanitary District, Army Corps of Engineers, Kane-DuPage Soil Conservation District, and several utilities.

Focusing On Infrastructure

The Fox River Bridge project follows in the footsteps of other high-profile infrastructure projects James McHugh Construction Co. has completed for the Illinois Tollway, the Chicago Department of Transportation (CDOT) and the Chicago Transit Authority (CTA) in recent years. McHugh reconstructed the Tollway's famed Oases. It also has earned recognition from CDOT for its bridge work, including the new North Avenue Bridge over the Chicago River – a hybrid cable-stayed/suspension bridge, which was the first of its kind in Chicago – and the 18th Street Pedestrian Bridge, CDOT's first-design-build bridge project.

"McHugh has been very fortunate," says Gould. "We really put a focus on infrastructure work about five to six years ago. In addition to the Fox River project, our infrastructure group is working on CTA stations, some high-tech bridges, some standard bridges, and is doing some work at the airport. So, we have a nice mix of infrastructure projects." n

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