Many bridge specifiers consider covered timber bridges relics from the last century, but in fact the longest timber bridge in the U.S. has just been completed in Ohio over the Ashtabula River.

It is the fifth timber bridge built in Ashtabula County in the past 75 years. The 613-ft span is named for John Smolen, a veteran timber-bridge designer who specified that the two-lane bridge should be engineered to carry highway loads. This means that the high-strength span could hold 16 loaded semitrailers lined up end to end in both lanes.

Smolen, the Ashtabula County engineer who conceived and performed the design calculations and acquired the grants to construct the bridge, got some expert assistance from Sentinel Structures Inc. of Peshtigo, Wis., a veteran company recognized as an international leader in the glued-laminated timber industry over the last 75 years.

Smolen said the fact that this bridge is on a busy highway—traffic count was about 2,500 vehicles a day—was key to obtaining funding for its construction. The project qualified for $5 million in federal bridge grants. The Ohio Public Works Commission contributed $800,000, and the county's share of motor-vehicle gas tax footed the balance of the $8 million price tag.

Finding someone to build the project was almost as challenging as arranging the funding. “No one has ever done a timber bridge of this size,” said Ryan Cochran, an owner of...
Union Industrial Contractors (UIC) of Ashtabula. “It is a very nontypical structure compared to just about any bridge we’ve ever built, and we’ve done some complicated projects.”

Union won the bid to build the covered bridge—only one other builder was interested enough to submit a bid. In contrast, Cochran said there could be dozens of bidders on a concrete-bridge project. The project resonated with UIC because it had experience in covered bridge construction and renovation.

“We tend to be most successful with the jobs nobody wants,” Cochran said of the 30-year-old company. “The more difficult, the better our chances are for landing the project and being successful.”

The new bridge is a showcase of structural glued-laminated timber. (The main trusses are made up of glued-laminated lower chords, upper chords and verticals. The diagonal tension members are high-strength, fatigue-resistant steel bars.)

The roof trusses are supported by the main trusses and are glued-laminated with 5 1/8-in. x 13 3/8-in. x 28-ft 6-in. upper chords. Steel tension bars in the vertical plane are designed to stabilize the roof trusses for wind bracing.

The transverse floor deck beams are 10 1/2-in. x 49 1/2-in. southern pine laminated timber. Deck panels supported by the floor beams are of various lengths to create a staggered splice pattern. The deck panels are 93 ft above the river. There also is a 5-ft-wide covered walkway on each side of the bridge.

The truss timbers were structural glued-laminated timber of treated southern pine. There is 51,000 cu ft of lumber, or 613,000 board-feet, in the bridge, enough wood to cover an entire football field to a thickness of 13 in.
The new bridge replaces a steel stringer bridge built in the late 1940s, which replaced another covered bridge at that time.

**Let it roll off**

Construction got under way after all the environmental impact hurdles had been completed. The area in which the bridge was constructed was known for its diverse wildflower population, much of which had to be destroyed as a swath was cut through the forest to accommodate the construction site. Amateur botanists moved as many plants as possible to a botany bank for introduction after construction.

The three piers, three footers and two abutments required 1,800 cu yd of concrete and 532,599 lb of rebar to build. Once that phase was done, work on the bridge itself began on the river floor and each bank.

Truss timbers arrived precut to the jobsite and were drilled for assembly by Sentinel Structures.

Carpenters worked throughout the fall and winter of 2007-08 to build the four spans.

Tammy Vaux, a carpenter on the project, said working on the bridge was unlike anything she had done before because the scale is so large—timbers, nails, drill bits, bolts and hammer were all super-sized for this massive project.

Because of this enormity, the builders had to strike a balance between preassembling as much of the bridge as possible while keeping the weight in check. They also had to construct the spans at a point that would be accessible to the cranes and still give the behemoths room to maneuver.

Cochran and others on the UIC team did extensive research and constructed numerous scenarios of crane selection and placement, working angles and distances.
lifting points and rolling options before bringing the cranes on-site. They decided that, due to the tight quarters near the embankments, they would need to roll off the two end spans onto a steel platform so a crane down below could ease them into place.

Smolen Engineering of Jefferson—the firm John Smolen and his son, Andrew, started after the elder Smolen retired as county engineer—did the engineering work for the erection plan. UIC also had to order custom-made rollers for the move.

They determined at least three cranes were needed for the moves. A 300-ton lattice-boom crane would do most of the work. It was aided by a 500-ton hydraulic boom crane.

The biggest challenge was indeed engineering the lift. Consisting of four equal spans of 152 ft each, the bridge would rise 93 ft above the river. Most covered bridges are only 20 or 30 ft above the water. While the two end spans could be built on the river banks and rolled or pulled into place with cranes, the center spans—each one weighing 162 tons—would have to be lifted from the river floor and eased onto the piers. The other option was to build them in place, a dangerous and expensive proposition.

Two days before the first lift was scheduled, a hard rain sent a torrent of water through the construction site and washed out the pad where the crane was to be situated. Crews quickly rebuilt the pad, and the span on the north side was rolled into place. Miller said, “Everything went into place like we thought it would.” It took 11 hours.

With the first span in place, the iron platform was removed and reassembled on the southeast abutment for what would be the final move.

The cranes were moved into place for lifting the center spans. The first center span, at the north end, was lifted and set onto the piers. It took 10 hours.

Two days later, the second center span went up in just two hours.

The final move, rolling the span off the south end and onto the abutment and pier, took 10 hours to complete.

The lifts did more than affirm the thoroughness of the research and planning that went into the critical phase. They also bore testimony to the workmanship of the tradesmen and Sentinel Structures—each span had 12 holes that had to line up with 12 anchor bolts on the pier.

Throughout May, roof trusses were raised into place while the cranes were available. Construction went rapidly once the spans were raised, as the massive floor deck sections were dropped into the spans and the pedestrian walkway inched across the gulf on both sides. The galvanized steel roof sheets, 626 of them, went up starting in early July.

Meanwhile, the county did its approach work and prepared to pave the highway leading to what locals called America’s “crown jewel of the covered bridge world.”

Safety was another big issue. The project would put carpenters in constant danger as they worked 100 ft or more above the river in inclement weather and against strong wind currents that rip through the valley.

Cochran said they set a zero-tolerance policy for safety-harness use. The unique configuration of the work required they modify existing safety equipment to meet the needs of this job.

**Visitor center**

There has been very strong interest in the attraction from bridge fans across the country. Vehicles bearing license plates from distant states were commonplace at the construction site. Vehicles bearing license plates from distant states were commonplace at the construction site.

Cocran said, “One thing is for certain, for the several dozen laborers and tradesmen who worked on the structure, and the general contracting company, it’s a great legacy to hand off to their children and grandchildren.” R&B

Cochran is owner of Union Industrial Contractors, Ashtabula, Ohio. Smolen is of Smolen Engineering, Jefferson, Ohio. Jaenicke is with the American Institute of Timber Construction. Rhude is president of Sentinel Structures, Peshtigo, Wis.