

Collapsed Pittsburgh bridge replaced in less than a year

When Greg Gorman, president and COO of PennStress, a precasting company based in Roaring Spring, Pa., was attending the annual meeting of PCI Mid-Atlantic in January 2022, he received word that a major bridge had collapsed in Pittsburgh, Pa.

When the Fern Hollow Bridge in Pittsburgh's Frick Park collapsed, four people sustained non-life-threatening injuries. Had the bridge collapsed an hour later, during peak commuter time, it could have been a different story.

Following the collapse, an emergency project team was assembled and given the green light to start working on the rebuild immediately.

With conventional methods, replacing a bridge this size typically would have taken three to four years, plus the time required to redesign the bridge, plan the bridge construction, obtain approvals, prepare the site, and install substructure elements. Using prestressed concrete beams for the bridge superstructure assisted the Fern Hollow Bridge completion in less than a year.

The project team—including the Pennsylvania Department of Transportation (PennDOT), the city of Pittsburgh, HDR Engineering, and Swank Construction—took a big step in rebuilding the bridge, opting to replace the old steel bridge with prestressed concrete beams from PennStress. This decision was made because of precast concrete's exceptional strength and flexibility, which have fueled the project's extraordinary construction rate.

The Fern Hollow Bridge ended up being a high-quality, resilient, and low-maintenance structure designed to maintain stability and strength for a 100-year service life. The bridge can withstand inclement weather, a harsh environment, hurricane-level winds, and occasional impacts from vehicles.

Using precast concrete helped the project team meet critical high-performance measures while reducing the need for other materials and human resources. Because precast concrete is fabricated off-site in a factory-controlled environment, PennStress was able to guarantee consistent, accurate pours every time and deliver structural components to the jobsite on a just-in-time basis. This accelerated the installation and minimized disruption to the surrounding environment.

In conjunction with precast concrete's inherent qualities, the replacement of Fern Hollow Bridge begged the need for

Swank Co. erects a 155 ft (47 m) prestressed concrete beam on the three-span Fern Hollow Bridge in Pittsburgh, Pa. The new structure replaces the bridge that collapsed January 28, 2022. PennStress, courtesy of Swank Co.





Pennstress delivers a 105-ton (95-tonne) super-load prestressed concrete beam to the Fern Hollow Bridge construction site in Pittsburgh, Pa.
 Courtesy of Pennstress.

an emergency acquisition system. The project team comprised both public and private players who worked intensely to meet unprecedented construction rates, delivering the bridge beams just six months after the initial collapse. It was exceptional for a bridge project of this magnitude to move so quickly and open in less than a year, thanks to close collaboration and a push to meet the community's urgent need.

In terms of project details, the replacement structure ended up being a three-span bridge, almost 100 ft (30 m) above Frick Park. There were 21 prestressed concrete bulb-tee beams. These beams are 155 ft (47 m) long, each weigh more than 100 tons (90 tonnes), and feature 10 ksi (68 MPa) concrete strength.

One obstacle was related to the design process. "The primary challenge in the design phase was the accelerated time factor," Gorman says. The project team, which consisted of the owners, PennDOT and the City of Pittsburgh; the contractor, Swank Construction; and the designer of record, HDR Engineering, met this challenge head on by working together. "The team performed the incredible feat of redesigning the original 450 ft span steel K-frame structure to a three-span prestressed concrete beam structure in a few months. Highly expedited shop drawing preparation by PennStress and subsequent review and approval by the project team were a success as well," he says. "A project of this magnitude from planning to completion can take five or six years. This bridge replacement from a challenging start to finish, including recovery and demolition, was less than 11 months."

Production, of course, was critical and, fortunately, did not pose significant difficulties. "We had no out-of-the-ordinary challenges in the production activity for these twenty-one large prestressed beams since we are accustomed to producing beams of this size," he says.

Delivery turned out to be greatest hurdle for PennStress in the process of this bridge replacement. "We worked with the project team immediately after our award to determine the safest feasible delivery routes for the beams through the city to



Crews use a small rough terrain crane to position the rigging in preparation for attaching it to the lifting loops embedded in the beam for the new Fern Hollow Bridge. Courtesy of Swank Co.

the jobsite," he says. "When it came time to deliver the super-load beams, the city of Pittsburgh operational managers, the police, and the motorcycle police did an excellent job of guiding us safely through the city to the site."

For the final span erection, the crane remobilized to the other side of the bridge. As a result, for delivery, an on-ramp lane of Interstate 376 was shut down temporarily. "We then passed the ramp and backed down it, and then continued to back the loads down South Braddock Avenue for nearly a mile through the city to the site," he says.

Fortunately, installation went smoothly. "Swank Construction developed and executed a great erection plan, and their installation went extremely well," Gorman says. "The outside spans were erected with a crane large enough to utilize single crane picks for each beam."

—William Atkinson 