

# STRUCTURAL TECHNOLOGIES Encompasses More Than Concrete Repair

The largest concrete repair contractor in the United States, STRUCTURAL TECHNOLOGIES is expanding into additional infrastructure markets and is dedicated to making new and existing structures stronger and longer lasting.

by Monica Schultes

STRUCTURAL TECHNOLOGIES provides a variety of services aligned to improve, protect, and enhance existing infrastructure. They are the exclusive manufacturer of VSL post-tensioning and stay-cable systems in the United States. Through acquisitions and evolution, STRUCTURAL TECHNOLOGIES also offers heavy-lifting and sliding products and services for new construction, as well as for the demolition of existing structures. While much of their work has been in the commercial building and transportation sectors, they have pivoted to increase their work on bridge construction, repair, and strengthening. These efforts to expand include new and existing public works projects, as well as water containment structures and underground structures such as pipes and tunnels.

The amount of maintenance and repair work on existing transportation structures is increasing, and with the influx of funds from the Bipartisan Infrastructure Law, STRUCTURAL TECHNOLOGIES anticipates more new construction in their pipeline. With their renewed emphasis on the transportation market, they get involved in projects through several avenues. For example their upstream group identifies long-term opportunities and the type of project delivery method. While STRUCTURAL TECHNOLOGIES is frequently a specialty subcontractor or part of a joint venture, there are occasions where operating as the general contractor makes sense.

STRUCTURAL TECHNOLOGIES has offices in Dallas, Tex.; Denver, Colo.; Washington, D.C.; and Pompano Beach,



On the Interstate 59/20 project in Birmingham, Ala., STRUCTURAL TECHNOLOGIES used an alternative method to the traditional span-by-span erection of the precast concrete segments using longitudinal erection trusses. Each segment within a span was erected onto custom-designed shoring towers, which allowed the use of traditional equipment and provided the contractor with flexibility in assigning crews and equipment to meet the aggressive schedule. All Photos: STRUCTURAL TECHNOLOGIES.

Fla., and their teams work in tandem with more than 3000 employees of parent company Structural Group Inc. which has 40 U.S. offices. According to Bob Sward, vice president of STRUCTURAL TECHNOLOGIES, “From early project stages until the end of a structure’s life, we provide consultancy, engineered products, and construction

services that enable durable and sustainable solutions.”

## **Durable Structures**

When state agencies plan for bridges with service lives of 75 to 100 years, STRUCTURAL TECHNOLOGIES supplies VSL post-tensioning systems designed to achieve those goals. The extent of

protection needed to safeguard the tendons against corrosion is specified for each bridge. The most common protection level (PL) is PL2, which refers to the tendon encapsulation of main tensile elements as defined in the PTI/ASBI M50.3-19, *Specification for Multistrand and Grouted Post-Tensioning*.<sup>1</sup> The highest protection level, PL3, can be reached with fully encapsulated and electrically isolated tendons. In addition to the protection of the tendons, the system can be monitored throughout the structure's entire life cycle.

STRUCTURAL TECHNOLOGIES is well versed in all aspects of post-tensioning. However, Sward says use of the higher-level PL3 systems is uncommon in the United States. "There have been some demonstration projects, but the cost-benefit ratio over the life of the structure is difficult to quantify at this stage," says Sward. "The current perception in the United States is that the extra protection from PL3 systems may not be worth the premium cost," he adds. With more long-term data amassed from test projects, that trend might change. (For more details on PL3 post-tensioning systems, see the Concrete Bridge Technology article in the Summer 2023 issue of *ASPIRE*®.)

### Seismic Partnership

In August 2023, STRUCTURAL TECHNOLOGIES solidified their commitment to expand their work in the transportation sector through a partnership with SHO-BOND & MIT, a Japan-based joint venture. The alliance adds advanced Japanese technologies in seismic repair and stabilization of structures to the company's product lines.

STRUCTURAL TECHNOLOGIES already provides carbon-fiber strengthening and cathodic-protection systems. Through the new partnership, they have access to seismic devices used to prevent bridges from becoming unseated during seismic events. If there is a possibility of such a failure, a restraint device such as the "shearing stopper" is one preventive measure.

Sward is enthusiastic about the opportunities that await. "Working with SHO-BOND will bring a wide range of repair, reinforcement, and preventive

## History of STRUCTURAL TECHNOLOGIES

The origin story of what is now Structural Group Inc. and STRUCTURAL TECHNOLOGIES is complex. Peter Emmons founded Structural Preservation Systems in Maryland in 1974. Since then, companies under the Structural Group umbrella have played an important part in developing concrete repair and maintenance solutions.

The Swiss company VSL, which is still in operation, was a pioneer in post-tensioning products. Its products have been used throughout the world since 1956 to build, repair, and strengthen bridges and buildings, and use of VSL products in the United States began on the West Coast in the 1960s. In 1998, Structural Preservation Systems purchased the U.S. license for VSL technologies. Bob Sward, vice president of STRUCTURAL TECHNOLOGIES, recalls that the business initially was called V-Structural LLC, but the name was changed to STRUCTURAL TECHNOLOGIES in 2012.

"While we have the exclusive rights to the VSL post-tensioning, stay-cable, and heavy-lifting systems in the United States, we also work collaboratively with VSL International on select projects," says Sward.

Structural Preservation Systems was eventually folded under the Structural Group umbrella of companies. Pullman was acquired in the early 2000s. It serves as the Structural Group's "union" arm for concrete repair and restoration, while STRUCTURAL or Structural Preservation Systems are

the "nonunion" arm. All the technologies that the company acquired or developed over time are housed in STRUCTURAL TECHNOLOGIES. The Structural Group family of companies offers a comprehensive suite of technology products and engineering services to make structures stronger and last longer, including carbon-fiber strengthening, cathodic-protection systems, and service-life modeling.

For decades, many have considered Emmons's book, *Concrete Repair and Maintenance Illustrated*,<sup>2</sup> to be the preeminent reference for evaluating concrete problems and formulating surface repair. Published in 1993, it has been translated into multiple languages and is used as an educational tool at numerous universities.

Emmons has received numerous awards as an expert on concrete repair. He served as president of the International Concrete Repair Institute (ICRI), past chairman of ICRI's Technical Activities Committee, and numerous ICRI and American Concrete Institute (ACI) committees. Emmons continues to lead the industry and has been recognized for his many contributions. In 2005 he was named one of *Concrete Construction's* "10 Most Influential People in the Concrete Industry," and in 2014 he was awarded ACI Foundation's Innovation in Concrete Award.

maintenance technologies that are commonly used in Japan, which will improve our offerings in high-seismic zones."

### Specialty Subcontractor

Post-tensioning and concrete segmental bridge construction are among the core competencies of STRUCTURAL TECHNOLOGIES. This fact is evident on the Mosquito Road Bridge project in El Dorado County, Calif. The structure is 375 ft above the South Fork of the American River and has a 536-ft main span with 322-ft end spans. The bridge is being constructed using the cast-in-place, balanced-cantilever segmental method. In addition to supplying the multistrand post-tensioning system, STRUCTURAL TECHNOLOGIES is providing the traveling forms for the project's superstructure.

As specialty subcontractor to Johnson Brothers Corporation, STRUCTURAL TECHNOLOGIES provided and installed the post-tensioning system and formwork for the precast concrete segments for the third phase of the bridge replacement project for Interstate 59/20 in Birmingham, Ala. The segmental precast concrete viaduct used custom falsework towers that were also furnished by STRUCTURAL TECHNOLOGIES for the span-by-span construction. (For more details on this project, see the Project and Concrete Bridge Technology articles in the Spring 2020 issue of *ASPIRE*.)

### Prime Time

When the majority of a project's scope is in their sweet spot, STRUCTURAL TECHNOLOGIES often functions as the general contractor for the project.



During emergency repairs of the post-tensioning system in the Roosevelt Bridge in Stuart, Fla., crews severed the existing internal bonded continuity tendons in one span and replaced them with new external unbonded tendons.

Such was the case for the repair of the Roosevelt Bridge crossing the St. Lucie River in Stuart, Fla.

When a routine inspection in 2020 noted the presence of cracking in one span on the southbound structure, the Florida Department of Transportation (FDOT) closed portions of the Roosevelt Bridge. FDOT acted quickly to assemble a team to perform the emergency repairs. To expedite the work, STRUCTURAL TECHNOLOGIES was selected as construction manager/general contractor, which was FDOT's first use of this project delivery method.

The segmental precast, post-tensioned concrete bridge consists of 41 spans on two parallel structures that are each approximately 4600 ft in length. It was determined that the cracking in one of the spans was a result of corroded tendons that had failed. STRUCTURAL TECHNOLOGIES worked collaboratively with FDOT and their engineers to repair the structure, including the post-tensioning tendons that had corroded, and return the bridge to service as soon as possible. To restore the segmental precast concrete structure's capacity, 48 new external post-tensioning tendons were installed and injected with a flexible filler. This innovative solution will protect against corrosion and offers FDOT the capability to replace tendons in the future if needed. An epoxy-overlay system was installed on the bridge deck for additional protection. (For more information on the Roosevelt Bridge repairs, see the Summer 2022 issue of *ASPIRE*.)

## Asheville Interstate Expansion

A key feature of the Asheville Interstate Expansion project is the modern precast concrete segmental bridge on the Blue Ridge Parkway over Interstate 26 (I-26). Six additional new bridges will be constructed as part of this corridor project that extends from Airport Road to the Interstate 40 interchange in Asheville, N.C. This portion of the I-26 widening project will expand the interstate from four lanes to eight lanes, doubling the roadway's capacity.

The three-span segmental precast concrete bridge is being constructed by

STRUCTURAL TECHNOLOGIES is using the balanced-cantilever system for construction of the Blue Ridge Parkway bridge over Interstate 26. After lifting a precast concrete segment into place, temporary post-tensioning bars are installed and tensioned to attach the segment to the cantilever.



a balanced-cantilever method. Serving as subcontractor to the joint venture between Fluor Corporation and United Infrastructure Group, STRUCTURAL TECHNOLOGIES has completed one cantilever pier and mobilized to start the next for the new 605-ft-long Blue Ridge Parkway structure. Construction is scheduled to be completed in 2024.

## Blue Ridge Parkway Part 2

STRUCTURAL TECHNOLOGIES is also at work on another project along the Blue Ridge Parkway in North Carolina. Work is underway to replace the historic Laurel Fork Bridge in Ashe County and is expected to be completed in late 2024. The project includes a segmental precast concrete bridge with cast-in-place piers and abutments.

The project to construct the new 550-ft-long, 30-ft-wide, and 90-ft-tall structure is a joint venture with Vannoy Construction, a local contractor whose work complements STRUCTURAL TECHNOLOGIES' segmental capabilities. STRUCTURAL TECHNOLOGIES is supplying and erecting the precast concrete segments, and furnishing and installing the post-tensioning system. The original structure built in 1939 has been demolished. Construction of the piers is currently under way, and erection of the precast concrete segments will begin in the spring of 2024.



A “shearing stopper” installed by STRUCTURAL TECHNOLOGIES. This device resists upward forces and horizontal forces in two directions to prevent the unseating or “stepping” of the superstructure, especially during seismic events.

## Knowledge Transfer

To succeed in the concrete repair industry, a company needs skilled and knowledgeable field personnel. STRUCTURAL TECHNOLOGIES realizes that the best design means nothing without proper execution and therefore emphasizes the need for continuous technical training and skills improvement of field personnel. This is a worthwhile investment in employees’ career growth.

Whether it is performing a repair or tensioning tendons, STRUCTURAL TECHNOLOGIES requires highly skilled professionals. Retaining and transferring knowledge across the company is vital to their success. Therefore, STRUCTURAL TECHNOLOGIES invests a considerable amount of time in training. For example, to preserve the skills and lessons that are learned on each project, they have recorded project supervisors and their crews on video and through interviews. Every activity is documented, from assembling formwork to chipping concrete, grouting, and tensioning a tendon. This vast learning library is available to everyone through the company intranet. “We have invested in our best asset—our people and their knowledge,” says Sward.

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Sward emphasizes that “safety starts with our frontline, including our commitment to protective helmets

instead of traditional hard hats.” (See the sidebar for more about this initiative.) “Our focus is to empower the people in the field to identify potential hazards. Every morning, they complete a jobsite safety analysis and see what is required to accomplish the work that day,” he adds. Cross training allows employees in the field to be prepared for a wide variety of scenarios. One day they are repairing cables that were cut in a building, and the next they are grouting tendons on a bridge.

“We are continuously trying to work smarter. We are constantly looking for ways to improve our process without sacrificing quality or safety,” emphasizes Sward. For example, on a stay-cable project in Ohio, field personnel saw ways to make small adjustments to the process to eliminate the need for a person positioned on the outside of the pylon during installation.

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## The Future

According to the American Road and Transportation Builders Association, 36% of all U.S. bridges (approximately 224,000 structures) require repair work or replacement.<sup>3</sup> With that in mind, STRUCTURAL TECHNOLOGIES plays a vital role in efforts to prolong the life of and strengthen aging bridges. The entire concrete industry learns valuable lessons from repairs and, as a result, gleans a better understanding of the

## Hard Hats to Helmets

While many consider Peter Emmons’s contributions to the construction industry to be his legacy, the “Hard Hats to Helmets” (H2H) initiative is his passion. Emmons has worked tirelessly on H2H since a fatal accident involving an employee on a Florida jobsite demonstrated the need for better head protection. Emmons believes that “the construction industry can reduce the number of head injuries and fatalities today by saying ‘no’ to continuing to use 60-year-old hard hat designs and ‘yes’ to helmets that deliver the best technology available for head protection.” The sole mission of H2H is to educate the industry on how to reduce traumatic brain injuries and deaths in construction.

Everyone at STRUCTURAL TECHNOLOGIES is involved in promoting the change from hard hats to helmets. The American Society of Concrete Contractors and other industry groups also stand behind the initiative to evolve from traditional hard hats toward the energy-absorbing helmets that better protect frontline workers.

long-term performance of bridges. To demonstrate their commitment to the industry, STRUCTURAL TECHNOLOGIES teamed with the National Concrete Bridge Council for a webinar series entitled “Preserving and Extending the Service Life of Concrete Bridges.” Access to the previously recorded six-part series is available at <https://www.structuraltechnologies.com/preserving-extending-the-service-life-of-concrete-bridges>.

## References

1. Post-Tensioning Institute (PTI) and American Segmental Bridge Institute (ASBI). 2019. *Specification for Multistrand and Grouted Post-Tensioning*. PTI/ASBI M50.3-19. Farmington Hills, MI: PTI.
2. Emmons, P. H. 1993. *Concrete Repair and Maintenance Illustrated: Problem Analysis, Repair Strategy, Techniques*. Kingston, MA: R.S. Means.
3. American Road and Transportation Builders Association. 2023. “Bridge Report.” <https://artbabridgereport.org>. 📄