

# DELIVERING CONCRETE INNOVATIONS

Cianbro has adapted to new delivery methods, technologies, and design techniques to construct complicated projects on tight schedules and budgets

by Craig A. Shutt

Cianbro Corporation has built a reputation for taking on challenging projects and producing cost-efficient bridges that are completed on time. As new delivery methods have developed, the general contractor has thrived, becoming well known for its work in several specific types of concrete bridge projects that often provide signature designs.

"Cianbro is a one-hundred-percent employee-owned company, and that commitment aids our drive to deliver on time, with high quality, and on budget," says Kaven Philbrook, senior project manager for infrastructure at the Pittsfield, Maine-based company. "We have become known in the industry for undertaking very unique, difficult projects where schedule is of the utmost importance."

Founded in 1949, Cianbro has long worked in the railroad industry, gaining

experience with a variety of accelerated bridge construction (ABC) techniques as well as skill in constructing efficient movable bridges. Its work with concrete bridges has led to expertise with such specialized structure types as segmental bridges, cable-stayed designs, and arched substructures. "We have become known for doing these projects from Florida to Maine," says Philbrook.

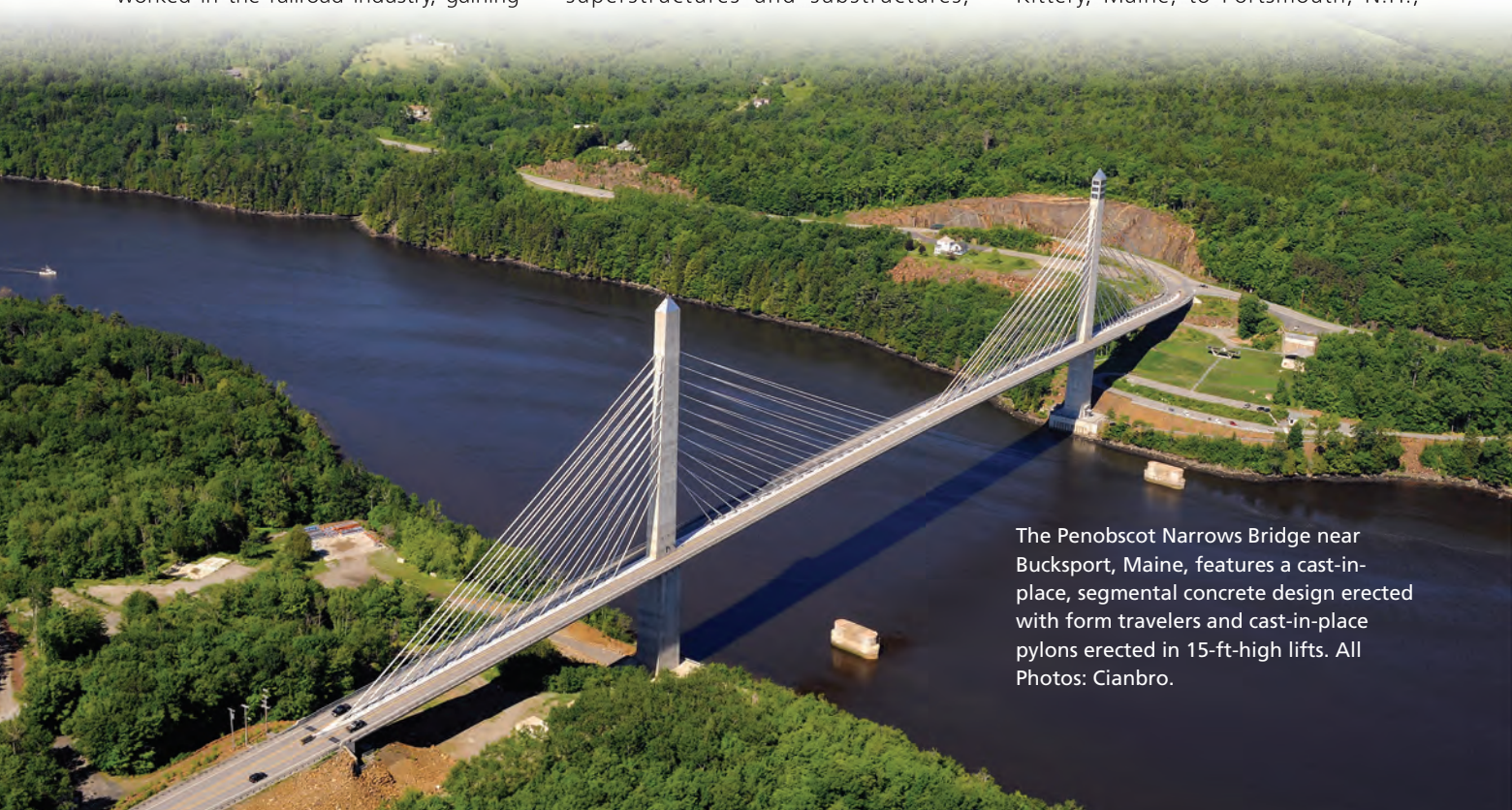
## Segmental Designs

Segmental concrete bridges have become a key part of the company's work and offer significant benefits in the right circumstances. "We're very selective about which segmental projects we take on," Philbrook says. "If the project presents unique challenges, especially in having aggressive schedules, we are very competitive."

Concrete segmental designs can provide benefits to designs for both superstructures and substructures,

says Brenda Nichols, Cianbro's senior design engineer. Her presentation at the 2016 Construction Practices Seminar, sponsored by the American Segmental Bridge Institute (ASBI) and featured in the Fall 2016 issue of *ASPIRE*<sup>™</sup>, outlined benefits of concrete segmental substructure components, such as footings, pier caps, and column units. Benefits accrue similarly for segmental superstructure components, she noted, including speed of erection, reduced user costs, better quality and durability, and improved safety.

Philbrook is currently working on a major segmental project, the \$170-million Sarah Mildred Long Bridge, a joint venture between New Hampshire and Maine to replace what was reported to be the number-one red-listed bridge in New Hampshire. The new two-level precast concrete segmental box-girder structure connects Kittery, Maine, to Portsmouth, N.H.,



The Penobscot Narrows Bridge near Bucksport, Maine, features a cast-in-place, segmental concrete design erected with form travelers and cast-in-place pylons erected in 15-ft-high lifts. All Photos: Cianbro.



Precast concrete tubs for forming the footings on the Sarah Mildred Long Bridge provide both short-term and long-term benefits.

across the Piscataqua River. When it opens later this year, the upper level will carry vehicles while the lower level will provide rail access. It will include a 300-ft-long movable lift span supported by four 194-ft-tall concrete lift towers.

“This is the first bridge in the world to have the towers constructed this way,” Philbrook says. Cianbro is working through a construction manager/general contractor (CM/GC) contract and chose to produce the 100-ton, match-cast tower segments in this format due to the tight timetable. “Using precast concrete shortened the schedule by months.”

The company has produced cast-in-place concrete towers for cable-stayed projects and originally planned to do these similarly, Nichols says. But the team realized that precast concrete could save time and expense. Casting each tower on site would have added four months to the bridge schedule’s critical path, she explains.

### Alternative Delivery Methods

The project’s CM/GC delivery method plays to Cianbro’s strengths, Philbrook notes. “We do very well with alternative delivery methods that encourage more collaboration and innovative thinking.” Cianbro was selected as the construction manager for the project and worked closely with both states and the FIGG Design Group to devise the best design. The company then won the

general-contractor portion and worked with FIGG to optimize scheduling and constructability issues.

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Cianbro excels at CM/GC projects, Philbrook says. In that format, the design team works for the owner and focuses on outlining all issues to avoid budget surprises. “We identify all potential risks and put aside funds to cover them,” he explains. “If they don’t happen, we all save money, and if they do happen, we’ve already identified them and share the costs.” The format produces a more accurate cost, as the contractor isn’t factoring in funds for potential risks that aren’t being shared or don’t arise.

The Sarah Mildred Long Bridge, for instance, uses 10-ft-diameter drilled shafts, but Cianbro wasn’t certain how much slope there would be to the ledge

The \$170-million Sarah Mildred Long Bridge currently being constructed includes an upper level for vehicles and a lower level for rail access. The precast concrete segmental box-girder structure features a movable lift span supported by four 194-ft-tall concrete lift towers.

into which they would be driven. The contract called for a higher payment if the slope turned out to be higher than a certain percentage. “That way we share the cost only if the issue arises,” Philbrook explains.

Cianbro produced the Penobscot Narrows Bridge under an owner-facilitated design-build (OFDB) contract, in which the firm works directly for the owner. The company’s bid was selected by Maine Department of Transportation officials as providing the best combination of schedule, cost, and team qualifications. The cable-stayed bridge over the waterway near Bucksport, Maine, features a cast-in-place, segmental concrete design.

The project arose after an initial plan to repair the existing bridge found the cables so deteriorated that the bridge had to be immediately downgraded to a 12-ton load limit. With the nearest detour more than 50 miles away, Cianbro was given 39 months to design and build the new structure.





The Humpback Bridge over the Boundary Channel on the George Washington Parkway near Washington, D.C., consists of a single span with segmental precast concrete arches.

“Our goal was to eliminate the time involved with the permitting process for putting piers into the water by creating a 1161-ft-long main span supported by the cables,” he says. Cast-in-place concrete segments were erected over the water with a form traveler and cast-in-place concrete pylons were constructed in 15-ft-high lifts. The project proved so successful that it received an ASBI Award of Excellence.

New delivery methods are gaining popularity, Philbrook says. “We see them happening more today as states see the benefits.” Since its work began on the Sarah Mildred Long Bridge, he adds, the firm has gained two more CM/GC projects in New England.

### Arched Designs Grow

Cianbro also has gained notice for its work on concrete-arch bridges, creating several dramatic structures that retain the legacy of older bridges while offering modern building techniques and materials. “Typically, we stand out on arched designs due to our in-house construction-engineering capabilities and the innovative ways we use to erect the arches,” Philbrook says. Those methods include tie-backs and skylines. “We used all kinds of means and methods, designed in-house, to make us very competitive in meeting schedules.”

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Segmental precast concrete arches were designed for the Humpback Bridge over the Boundary Channel on the George Washington Parkway near Washington, D.C. The single-span bridge, owned by the National Park Service, features half-arches made up of smaller segments. The arch pieces were match-cast in a horizontal position, with all seven segments for each half-arch cast in one setup, alternating segments. Each half-arch was cast in less than 1 week. The outer arches were cast with a façade using stonework saved from the original bridge. The half-arches were joined with cast-in-place concrete closure pours.

Aesthetic touches such as reuse of stone and arched designs often result from communities wanting to retain a former appearance. Cianbro stays in touch with community concerns by gathering feedback as soon as

### Cianbro’s Growth

Cianbro was founded after World War II when Carl Cianchette revived the bridge-building firm begun by his father, Ralph Cianchette, in the mid-1930s. Three of Ralph Cianchette’s other five sons soon joined, and the business was incorporated in 1949. It grew steadily during the next 68 years, branching out to disciplines that include paper-mill maintenance, steel fabrication, hydroelectric dam repairs, ship upgrades, and more.

By 1979, the company had begun a successful expansion of its heavy-construction operations into the southern New England and mid-Atlantic regions. The acquisition of Starcon International Inc. in 2010 launched Cianbro into the \$12-billion refining and petrochemical service business with a nationwide presence.

In 1965, the company established a profit-sharing program for qualified employees, which led in 1977 to the company offering team members the opportunity to buy stock in the company. By the early 2000s, Cianbro was transitioning to a 100% employee-owned firm. In 2014, the National Center for Employee Ownership ranked Cianbro 13th among the largest 100% employee-owned firms in the United States. Today, Cianbro is one of the country’s largest open-shop contractors, operating in more than 40 states. It employs more than 4000 people.

possible. “We see a lot more input desired on all types of bridges, not just signature ones,” Philbrook says. “The community wants the bridge to fit the community on every site, and people are making their concerns known. We’re very proactive in encouraging community involvement to gain their support.”

That was a key part of the Sarah Mildred Long Bridge’s design. “We worked with Maine officials, who were very focused on getting community involvement in the design and scheduling. We’ve had a number of meetings to address the design and bridge shape to meet their concerns.”



Concrete tolerances were tight (1/4 in.) on the piers used for the Brightman Street Bascule Bridge over the Taunton River between Fall River and Somerset, Mass. Cianbro also employed a full-time, on-site quality-control team to oversee concrete mixture proportions.

On some projects, including the Humpback Bridge over the Boundary Channel, Cianbro subcontracted the concrete fabrication. It is precasting components for the Long bridge, because the site offers no space for staging and delivering components from an outside plant. "We look at how it can be done most efficiently," Philbrook says.

## Concrete Innovations

Because it operates a concrete facility in Pittsfield, Maine, Cianbro stays current with product trends, taking advantage of new concepts, especially as bridge owners look to push 75-year design lives closer to 100 years. "We're using high-performance concrete with corrosion resistance and high strength more often," Philbrook explains. "It's a case-by-case basis as to how we achieve the longevity goals the owner desires, but we are always looking for ways to provide higher quality, better corrosion resistance, and lower permeability."

Concrete strength in general is higher today, he adds. "We used to typically get 6500- to 7500-psi mixtures, but now it's often up to 10,000 psi. Corrosion inhibitors are becoming more numerous and widely used to bolster those properties. Some states also are looking at using epoxy coating on all reinforcing steel, with some going to

galvanized or stainless-steel options."

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Concrete tolerances are tightening, too, as can be seen with the company's work on the Brightman Street Bascule Bridge over the Taunton River between Fall River and Somerset, Mass. Precision was critical for the concrete bascule piers to ensure lifting equipment at the top performed flawlessly. The concrete needed to meet tolerances within 1/4 in., allowing the machinery's grout pads to cover the rest.

Precise concrete mixtures were used to cast the counterweights and lightweight concrete fill for the grid deck. Cianbro used a full-time, on-site quality-control team to oversee mixture proportions. "We ensured the concrete was mixed precisely, with every truckload tested for air entrainment, slump, water-cement ratio, and other properties," Philbrook says. "Everything was double-double checked."

On-site safety also is double-checked,

he notes. At the Sarah Mildred Long Bridge in early January, those systems led to 810 days with no injuries. "Our program starts at the top but it's very much driven from the bottom," he says. At the top, it includes creating work plans that emphasize identifying and engineering out all hazards and building safe access roads and sites. Safety meetings are held at regular intervals during the construction process as well.

The bottom-up drive comes from the Cianbro accident-prevention process in which each work-site employee submits two forms per month noting an improvement for the site or flagging a potential hazard. "We take immediate action and then see if there is a way to avoid them on future projects."

Cianbro takes its interest in employee needs a step farther with the Cianbro Institute, which helps train new personnel and expand the skills of existing employees. The program includes classes as well as visits to project sites. For instance, the program offers five levels of training for riggers, with some project riggers making presentations and students visiting sites to do some rigging.

"We encourage employees to learn new skills and improve their value," Philbrook says. As an employee-owned company, it benefits the company to have its owners gaining more expertise. "When our employees upgrade their skill sets, it helps all of us by making them more valuable."

Those skills will come in handy as Cianbro continues to look for innovative ways to meet new challenges that arise with delivering their complicated projects on-time and on-budget. **A**

## EDITOR'S NOTE

*The Penobscot Narrows Bridge was featured in the Winter 2007 issue of ASPIRE™, and the Humpback Bridge over the Boundary Channel was featured in the Winter 2010 issue.*