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SUMMER 2018



ON THE COVER:

Five 38,000-gallon tanks are the backbone of Minnesota's largest on-site wastewater treatment plant to date.

Photo courtesy of Wenck Engineering.

Precast Solutions
(ISSN 1934-4066 print, ISSN 1934-4074 online)
is published quarterly by NPCA,
the association of the
manufactured concrete products industry.

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Taking Denver



Rendering courtesy of Denver Department of Public Works

by Storm

Precast plays a **winning role** in Denver's **largest-ever** storm drainage project.

By Bridget McCrea



Photo courtesy of Forterra

Precast concrete is at the heart of Denver's largest-ever stormwater drainage project.

The city of Denver stakes its claim to fame on the fact that it sits at one mile above sea level. However, it's what's going on below ground that has been generating headlines lately.

The city has taken on a huge infrastructure replacement project that incorporates parks, rivers and stormwater channels. The Globeville Landing Outfall (GLO) project is already well under way and focuses on improving connectivity, reclaiming a concrete culvert as park land, adding a natural open channel with vegetation that will move stormwater safely, and enhancing the overall park design.

PROTECTING PEOPLE AND PROPERTY

The project includes a redesign of Globeville Landing Park and an open channel connecting to the South Platte River. The overall project is referred to as an outfall since this is the location where stormwater enters the South Platte River. Essential to improving flood protection in a few specific areas, GLO is the first of several steps being taken to safely receive stormwater from the other project areas.

Heather Burke, public information specialist with Denver Public Works, said the project will protect people and property in the area during major floods. She said the city is also working to improve water quality by reducing contaminants entering the river through stormwater runoff.

"This project is intended to address recurrent flooding problems in these neighborhoods and reduce the potential for

catastrophic flood damage," she said. "The Platte to Park Hill Stormwater Systems program represents the largest project Denver has ever undertaken to account for 100-year flood protection to help protect homes and people."

Precast concrete took center stage during the early stages of the project, when the city's engineers, the contractor, and precast manufacturer Forterra worked together to sort out the options and come up with the best plan for the new, reinforced concrete storm sewers.

Forterra manufactured a 500-yard-long, 15-foot-by-12-foot precast concrete box culvert tunnel for the project. Jeff Arnold, vice president and general manager for Forterra's North Region, said the project kicked off when the city reached out to discuss options for making the tunnel.

"We talked about using round pipe or box culvert, and how we would utilize standard-loading box culverts," Arnold said. "We basically partnered with the city's engineers on the design and fed them back the information on our production capabilities."

Arnold said a cast-in-place option was discussed early on, but it was dismissed due to incompatibility with the project itself and its surroundings.

"Cast in place is an option, but based on how deep the pipes had to be buried (up to 25 feet down) and the speed at which it all needed to be constructed, precast was by far the best choice," Arnold said.

Burke cited the speed of precast as well.



The Globeville Landing Outfall will protect homeowners and property from catastrophic flood damage.

“Precast concrete was preferred for the large boxes because of the ease and speed of the installation,” she said. “Schedule was a driving factor on this project.”

MAKING THE GRADE

For the massive infrastructure project, Forterra manufactured 547 linear feet of 15-foot-by-12-foot precast, rubber-gasketed box culvert; 855 linear feet of 14-foot-by-12-foot culvert; and 1508 linear feet of 8-foot-by-8-foot culvert. It also supplied various quantities of round reinforced concrete pipe. And while the manufacturing process itself wasn’t particularly challenging or out of the ordinary, Arnold said the construction schedule included “very strict joint tolerances” to ensure a watertight seal.

Aurora, Colo.-based Ames Construction was the contractor for the project, and Project Engineer Shawn Kronebusch said the tight tolerances were yet another reason precast stood out as the material of choice for this particular project. Not only did the excavation depths range from 20-to-25 feet, they are located on a city street.

“Shoring was quite a challenge, to say the least,” said Kronebusch, whose firm drove sheet pile into the ground on each side culvert, lined it, excavated, and then set the culverts.

Kronebusch said precast helped Ames Construction save on project costs because it allowed the company to “do a bit of work each day,” and then move the sheet pile to the next location.

“The purchase of the sheet pile alone was quite expensive,” he

added. “But we were able to move our shoring just a little bit each day in order to be more economical with it.”

All precast pieces were preassembled and inspected for fit and finish before they left the yard for delivery to the job site. For Forterra, which is capable of making spans of up to 20 feet by 12 feet in size, the products themselves weren’t especially challenging to make.

Most of the boxes were 15-foot-by-12-foot or 14-foot-by-12-foot, according to Arnold, while the typical culvert box design tops out at 12-foot-by-12 feet.

“So, while that’s definitely more ‘mega box,’ it was right up our alley in terms of project size,” he said.

As Denver’s largest-ever storm drainage project, the GLO is going to take a few years to complete. Ames Construction handled much of Phase I by installing the precast culverts and pipe, the last of which were delivered to the job site in early April.

CONSISTENT PROJECT, CONSISTENT MIX

Having attended several construction meetings over the last year, Arnold said he’s heard only positive feedback about GLO and the role precast concrete played in the project’s success so far.

“Everyone is very happy with the project, the timeline and the installed product,” Arnold said. “The contractor has done a nice job with the installation, and the line looks great.”

To specifiers who may be considering precast for similar projects in their towns or cities, Arnold said the fact that products were manufactured in a controlled environment where quality control is ongoing throughout the process makes it an excellent choice for large infrastructure projects.

“We delivered the boxes with the gaskets preinstalled, so basically the customer took them right off the truck and put them right into the excavated hole,” Arnold said. “All with no additional work like you’d find with field-poured concrete. It’s a consistent product and a consistent mix.”

Kronebusch echoed Arnold’s sentiment and said the completed phase was a definite success.

“The tolerances on the culverts were a challenge, but Forterra was great about working with us on that and other specifics,” he said. “We all went through a bit of a learning curve at the start of the project, but we were able to work together as a team, think through the problems, and then come up with a workable solution.”

Burke said the city is very happy with the project as well.

“GLO will help protect people and property in the area during major floods,” she said. “It’s also part of the city’s efforts to improve water quality, to make the South Platte River a more valuable amenity to the city, and to promote active, healthy lifestyles for Denver’s residents.” **PS**

Bridget McCrea is a freelance writer who covers manufacturing, industry and technology. She is a winner of the Florida Magazine Association’s Gold Award for best trade-technical statewide.

Precast Tunnel Crop Distribution

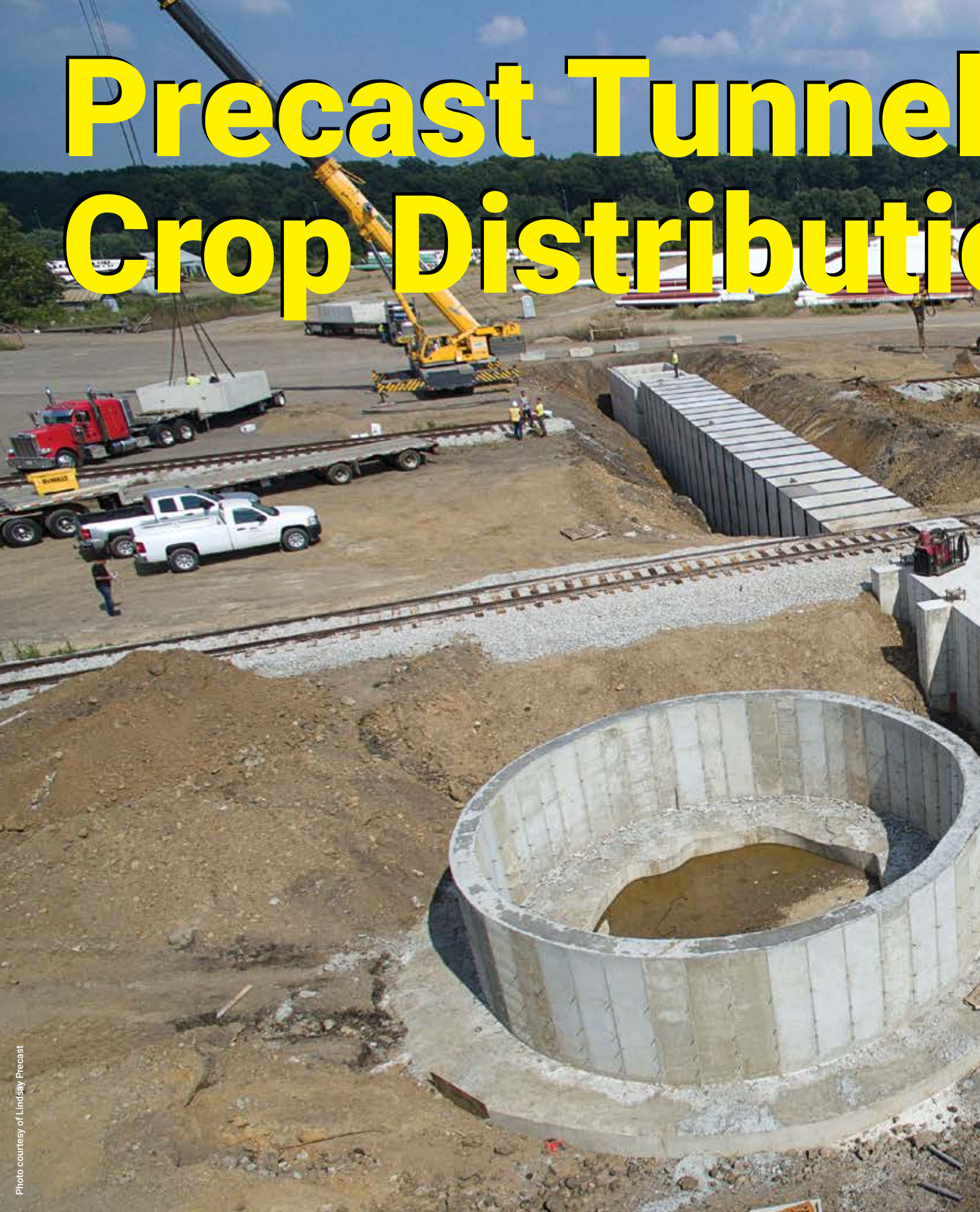


Photo courtesy of Lindsay Precast

It Makes on Easy



By moving the conveyor system underground, crops can be moved **quickly** without impacting surface traffic, creating a **more efficient** operation.

Mark Crawford



Photo courtesy of Lindsay Precast

By creating an underground precast concrete tunnel, farmers can get their crops to market quicker without slowing down rail or road traffic.

One of the toughest jobs for farmers is getting their crops to market. To help farmers in northeastern Ohio deal with this issue, Lindsay Precast of Canal Fulton, Ohio, was called in to assist with an agricultural project that greatly improved the ease and efficiency of sorting and distributing grain.

Deerfield Ag Services, which owns a grain elevator in Massillon Energy & Technology Park in Massillon, Ohio, wanted to make infrastructure improvements to eliminate extra trucking moves in order to streamline the overall operation. These improvements would not only benefit customers, but also give Deerfield Ag Services a competitive advantage in the Ohio marketplace and the global market for grain sales.

The project – a partnership between METP, Republic Short

Line Railroad and Deerfield Ag Services – is an underground conveyor system. By moving this function underground, surface truck and rail traffic on the METP site will flow without delays from crop-processing functions such as farm trucks crossing the railroad tracks. The end result is a safer and more efficient operation. METP and Deerfield Ag Services worked with Lindsay Precast to create the precast pieces while Tiger Sand & Gravel, located on the METP site, provided the necessary base and fill.

PRECAST TUNNEL KEY TO SUCCESS

The project enables trucks hauling soybeans and corn from across northeastern Ohio to dump their loads into a pit at Deerfield Ag's terminal. A conveyor then moves the grain through

a tunnel built with precast concrete box culverts. The tunnel runs under a main road and two railroad tracks on the METP site, where it connects with grain bins. Deerfield Ag can then load out rail cars and shipping containers full of grain that are exported to businesses out of state, as well as throughout the world.

Lindsay Precast sets 150 to 200 box culvert projects every year, but this project was unique with the rail loading, pit vaults and a very short window for installation. The precast box culvert tunnel protecting the conveyor system required precision due to an opening in the top of one piece which had to accommodate discharge from the rail car directly to the conveyor below.

“Not only did the opening in the precast have to be spot-on, but the setting of the units also had very little room for error to land between the tracks,” said Dean Wolosiansky, general manager for Lindsay Precast.

The size of the precast tunnel sections amazed Garret Kloots, vice president of business development for Tiger Sand & Gravel. “You could easily drive a full-size pickup truck through the tunnel section, that’s how large these pieces are,” he said. “The size and the overall strength of the tunnel is impressive, especially considering tractor trailers and trains are being driven over the top.”

The 150-foot (10-foot-by-12-foot sections) box culvert run ties into two 16-foot-by-12-foot hopper vaults. This enables the two loading bins to funnel crops onto the conveyor, which then transports the produce under the tracks to a sorting and storage facility. The sorting facility’s walls are tied into the box culvert sections, making a smooth transition from basement to tunnel.

“Unlike many culverts, the box sections were taller than they were wide to accommodate the slope of the conveyor over the entire run,” said Wolosiansky. “With a top slab of 22 feet and bottom slab of 20 inches, the pieces were not light, to say the least.”

Some pieces weighed as much as 75,000 pounds. All 36 pieces, including the tunnel and vaults, were delivered and set in two days. Precast concrete was selected for the project as a cost-effective solution that minimized negative impacts to ongoing operations and downtime on the site.

“Our precast was pre-manufactured and cured ahead of time so the rail line was only down for a couple of days,” Wolosiansky added. “The combination of equipment, facilities and resources as seen at METP is rare to come by. This is what made the short window possible.”

A SMOOTH OPERATION

The project is already having a positive impact on the agricultural market in Ohio due to the efficiencies the tunnel system created for Deerfield Ag and METP. Produce moves from field to rail car within minutes.



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“To us, the biggest surprise was how quickly everyone responded to the idea,” noted Kloots. “It is quite exciting to see how one project can bring together many industries: agriculture, rail, industrial, aggregates, concrete and engineering.”

Within a year of the initial concept, an agreement was in place with Deerfield Ag Services and plans were drawn up and reviewed.

“Everyone was hands-on and willing to help out where they could to make the project happen in the timeframe desired,” said Wolosiansky. “We love challenges here at Lindsay – some are large scale and some are fine details, and this project required a little of both. Like any project, there are always surprises, but it is the people and the companies that step up and make a difference to make sure the project is a success.”

“Lindsay Precast had all the pieces made and delivered within a couple of weeks,” added Kloots. “Their eagerness to be part of the project, along with their quick action, really got everyone excited about the end results to come.”

As METP looks toward providing intermodal rail traffic and growing the number of tracks, the tunnel and conveyor system allows the park to expand safely by reducing congestion and keeping farm trucks away from the area. **PS**

Mark Crawford is a Madison, Wis.-based freelance writer who specializes in science, technology and manufacturing.



Photo courtesy of PennStress

Accelerated bridge construction was the best choice for the state Route 11 bridge in Carlisle, Pa., due to its speed of installation and limited impact on motorists and wildlife.

A Better Bridge Option

By Shari Held



Ultimately PennDOT District 8 chose to build its first completely precast bridge using ABC techniques. The old bridge was shut down July 29, 2017, and reopened 13 days later as a new, modular, single-span bridge.

PennDOT has been using ABC techniques since 2011. To date, it has built or is in the process of planning 100 bridges using ABC.

THE PERFECT ABC PROJECT

The 45-foot-wide and 56-foot-long bridge fit the bill for a successful ABC project. The project required a speedy execution, since SR 11 is the main emergency route for Interstate 81, a heavily travelled major corridor connecting to the turnpike. But catering to motorists' needs wasn't the only reason Prefabricated Bridge Elements and Systems, one type of ABC, was the best choice for this bridge.

With ABC and precast concrete, PennDOT could close the bridge for a brief two weeks. Using this strategy meant cranes could be placed on the roadway, protecting the wetlands close to the bridge. Property owners on all four corners of the bridge didn't have to see a crane in their backyards for months and construction workers were safer due to the shortened construction time frame.

"Any other technique, in this particular situation, would have increased the impacts to all of these," said Eric Gogola, a project engineer for HNTB Harrisburg, an infrastructure solution firm headquartered in Kansas City, Mo. "In addition, precast is cast in a controlled environment so the product is high quality. We know there won't be any issues with it."

PennDOT District 8 and HNTB decided to use a spread foundation rather than driving piles and making a deep foundation.

"It's a smaller bridge so the foundation didn't need to resist a lot of load," Gogola said. "And the underlying rock and soil was in good condition, so it was able to support the bridge."

PRECISION FABRICATION

PennStress fabricated the components for the substructure – two abutment walls, four wing walls and six footings. Northeast Prestressed Products in Cressona, Pa., fabricated the five Northeast Extreme Tee (NEXT) beams for the superstructure.

PennStress used 6,000 psi self-consolidating concrete reinforced with 60 ksi mild steel epoxy-coated rebar to fabricate the substructure elements. The concrete mix was poured into custom wood and steel forms in a "lay-flat" orientation.

The largest footing measured 6-feet-5-inches-wide by 37-feet-9.5-inches-long. It weighed 39 tons. The largest wing wall weighed in at nearly nine tons and measured 1-foot-6-inches-wide by 10-feet-8.25-inches-deep by 8-feet-4.5-inches-long. The two abutment walls measured 1-foot-7.5-inches-wide by 52-feet-1/16-inch-long, and 51 feet 10 9/16 inches long, weighing 42.5 tons and 43.9 tons, respectively.

The 81-year-old, two-span bridge, located southwest of Carlisle, Pa., on state Route 11, was "structurally deficient" and slated for a full bridge replacement. The only question was which method to choose – conventional or accelerated bridge construction.

"It's all project specific," said Kristin L. Langer, P.E., assistant chief bridge engineer for Pennsylvania Department of Transportation. "ABC is a better option where traffic impacts are a huge factor and we need to get in and out fast and keep construction workers safe."

If conventional construction with a road closure was selected, the estimated time frame ranged from three to six months. If one-lane staged construction was used, the project would likely have lasted six months to a year.

“We were able to attain that length largely because the depth was only about seven feet, making it still a legal load to ship on the road,” said Russell Dickson, vice president, engineering and production, for PennStress, located in Roaring Spring, Pa.

Dickson noted architects and engineers often struggle with placement of joints on precast bridge pieces and said his biggest piece of advice is this: “Be open to suggested changes from precasters that may help improve the overall structure. It’s a new type of construction, and the best way to do it is not yet completely known.”

The fabrication process presented several challenges, the biggest being the three-piece footers had to be match cast. The center piece was cast first, treated with a release agent, and then each side piece poured flush to it.

“When you pour the other piece adjacent to it, it fills in every nook and cranny, and the contour is a perfect match,” Dickson said.

Another challenge was correctly placing the connections between the walls and footers using a grouted splice coupler system. Two pieces of rebar were spliced together and spaced from 6-to-12 inches apart. One of the large abutment walls used 61 No. 8 couplers and 48 No. 6 couplers. They had to line up within 1/4 inch of each other. PennStress used a plywood template to ensure everything fit together perfectly.

The elements were produced and ready to go within three weeks. But before they left the plant, PennStress dry-fitted the bridge to make sure everything lined up precisely before it got to the job site. Through planning and precision, it did.



Photo courtesy of Lobar Site Development



Photo courtesy of PennStress

Crews were able to replace the bridge in a mere eight days thanks to the use of precast concrete materials.

AS EASY AS A-B-C

All elements were shipped in the same orientation as they were poured. It took 15 truckloads, with the larger loads requiring planned alternate routes. Two 450-ton cranes, one on each side of the bridge, then set the elements.

The installation process for a precast bridge is as simple as putting Legos together, but there is a learning curve, such as how to angle the large pieces for vertical orientation. Dillsburg, Pa.-based Lobar Site Development, the prime contractor for the project, had never installed a precast bridge before. The biggest challenge for Lobar was learning how to do it efficiently and get everything right the first time.

First, workers set the three-piece footers. Next came the abutment walls, and finally the superstructure. The NEXT Beams were placed and finished with closure pours of extra-high-performance concrete.

Lobar ran split shifts working around the clock and on weekends to meet the deadline.

“It’s a bit hard to imagine something of that size and scope to be completed in eight days,” Daubert said. “But we did it.” **PS**

Shari Held is an Indianapolis, Ind.-based freelance writer who has covered the construction industry for more than 10 years.

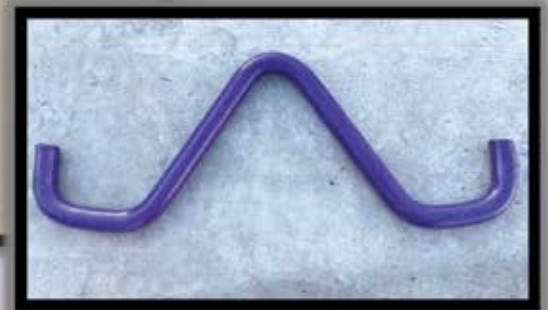
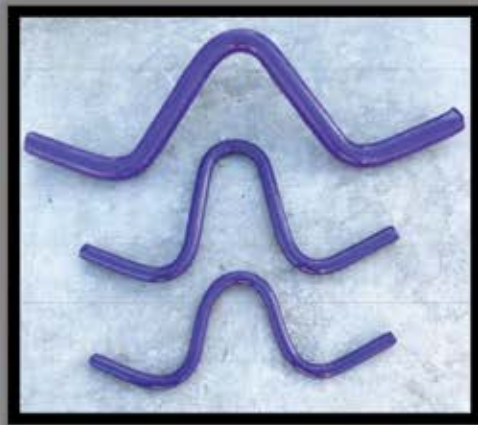


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Specifier Q&A

with Jamey Barbas, Project Director, Governor Mario M. Cuomo Bridge



Q: What is your background, field of focus and role on this project?

A: As project director, I've been responsible for the construction of the Governor Mario M. Cuomo Bridge in the northern suburbs of New York City on behalf of the New York State Thruway Authority. The \$3.98 billion design-build project to replace the Tappan Zee Bridge with a new twin-span crossing is one of the largest bridge projects in the nation. With more than 35 years of experience in bridge management, design, construction and inspection, my specialty is in complex and long span bridges. I led the inspection, design and construction support services for the reconstruction of the Williamsburg Bridge in New York City – one of the largest bridge reconstruction projects ever undertaken in the United States – and led the design of the major bridges of the AutoRoute 30 project in Montreal, Canada, one of the biggest public-private partnership bridge projects in North America.

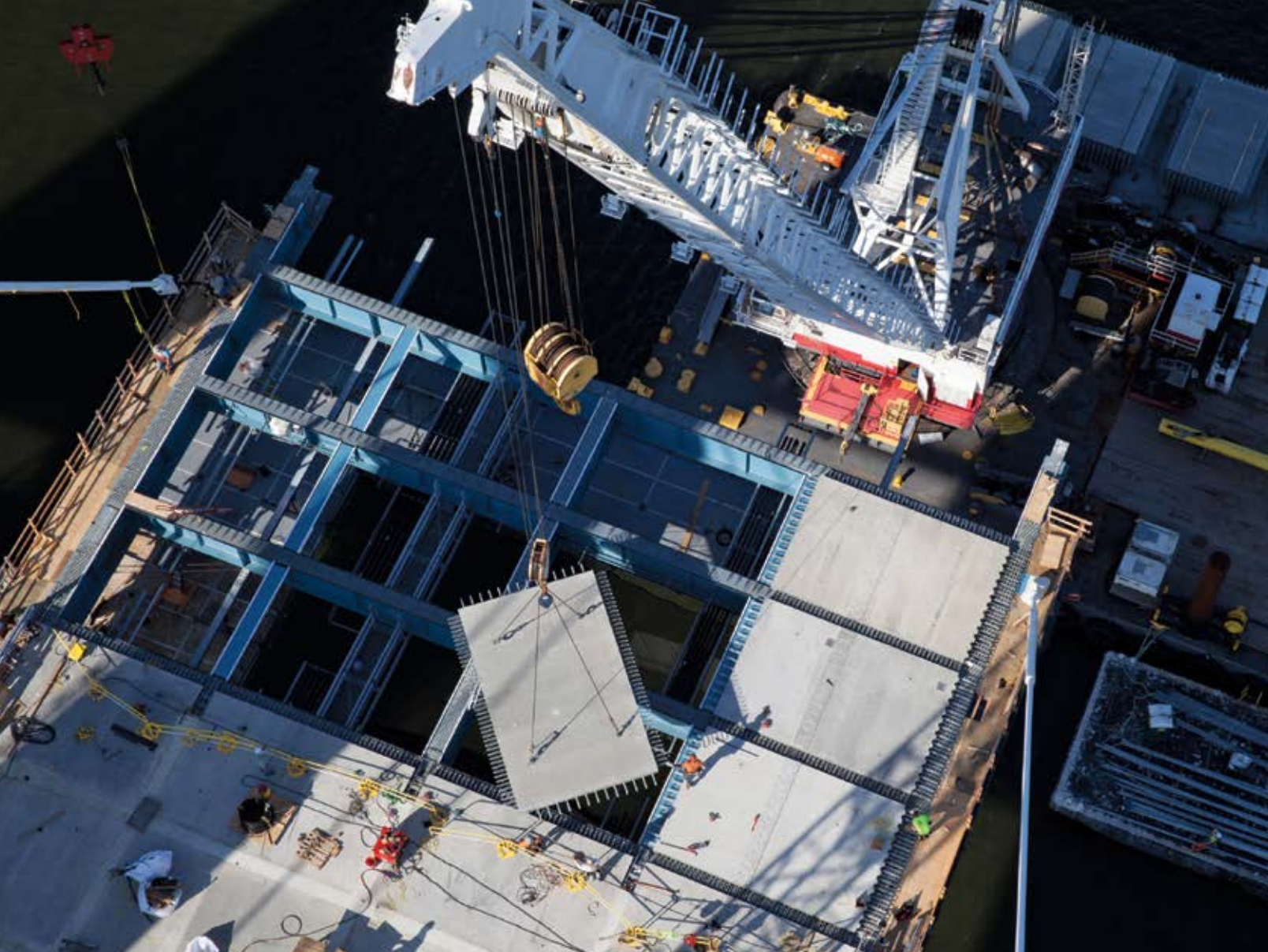
Q: What are the goals for the project and how will it meet those goals?

A: The Governor Mario M. Cuomo Bridge will stand as a signature structure for the Hudson Valley for generations to come. The new twin-span bridge is the first cable-stay crossing on the Hudson River. The 3.1-mile bridge provides a critical link across the Hudson River to serve the 50 million vehicles that use it annually. When the second span opens to traffic later this year, motorists will experience less congestion and frustration thanks to its eight general traffic lanes (four in each direction), breakdown/emergency lanes and state-of-the-art traffic monitoring system. Aside from being built transit-ready, the bridge will also feature

a shared path for pedestrians and cyclists featuring six scenic overlooks and serving as both a transportation and recreational facility. The bridge also will be illuminated at night with dark-sky compliant versions of LED light fixtures utilizing an aesthetic lighting plan to emphasize the distinct features of the new structure while respecting the scenic appearance of the Hudson Valley. Perhaps most importantly, the bridge is being built to last a century without requiring major maintenance. This investment is being assured by utilizing modern technology, such as structural health monitoring and asset management systems.

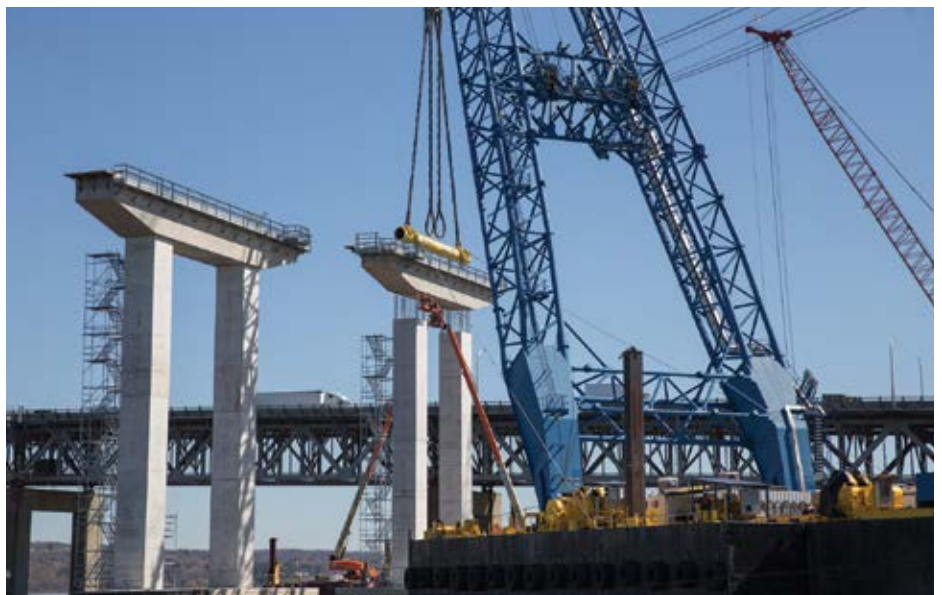
Q: Which precast concrete products have you used on this project and how were they used?

A: The project has used a vast amount of precast concrete materials, including pile caps, pier caps, road deck panels and crossbeams between its eight iconic towers. The four crossbeams – two 70-foot-long beams for the westbound span and two 60-foot-long beams for the eastbound span – weigh nearly 3,000 tons in total. The crossbeams were cast on a floating barge in Chesapeake, Va., and barged directly to the main span for installation. Nearly 7,000 steel-reinforced concrete deck panels are being used to provide the base driving surface. Weighing as much as 74,000 pounds each, the approach span deck panels are 12 feet long, range between 22 and 45 feet wide and nearly 11 inches thick. When fully assembled, the deck panels for both the approach and main spans will comprise a surface area of more than 65 acres – approximately equal to the deck space of all 19 U.S. Navy aircraft carriers currently in service.



Q: What have been the benefits of using precast concrete products on this project?

A: Modular construction with off-site fabrication and assembly has been utilized extensively. The use of precast materials on our unique 3-mile-long project site has aided with scheduling and eased construction. Working off-site under controlled conditions allows for a generally safer working environment and higher quality workmanship. **PS**



Photos courtesy of New York State Thruway Authority

The Governor Mario M. Cuomo Bridge in New York City will ease traffic congestion in the area and last at least 100 years without requiring major maintenance. Precast concrete was used for pier caps, road deck panels and crossbeams.



Out of Sight, Out of Mind, but Far from Idle



le

Award-winning on-site wastewater treatment and dispersal system boasts some **unique features.**

By Shari Held

Photo courtesy of Wenck



Photo courtesy of Wieser Concrete Products

Minnesota's largest on-site decentralized wastewater treatment plant features five 38,000-gallon and four 10,000-gallon precast concrete tanks.

The City of Afton, Minn., may be small – less than 3,000 residents – but it's a big tourist attraction. Located on a bay near where the St. Croix River merges with the Mississippi River, The Village, Afton's commercial district, retains the flavor of a mid-19th century river-town settlement. It also boasts Afton Alps, the largest ski and snowboard resort in the Twin Cities area.

Unfortunately, during the hot summer months the odor of raw sewage was ever present. And when the levee overflowed, sewage washed into the streets. The city's reputation as a destination location was threatened, and the nearby St. Croix River faced ongoing pollution.

That was the situation seven years ago. It took a lot of effort to convince residents that investing in an on-site wastewater treatment and dispersal system was the best solution. The project also experienced several other delays, including one to investigate possible underground Native American relics. But today, Afton boasts nine subsurface precast tanks – five of which are 38,000-gallon tanks and four are 10,000-gallon tanks – making

it Minnesota's largest on-site decentralized wastewater treatment and dispersal system. Afton's sewage issues are now underground and out of sight, just where they should be, and precast played a major role.

PRECAST PREFERRED

When the job went out for bid, both fiberglass and precast concrete products were options for the tanks.

"We found precast concrete was a better price, easier to install and more readily accepted by the installation contractors," said Peter Miller, executive vice president and project manager for Wenck, a Maple Plain, Minn.-based environmental engineering firm.

Tony Birrittieri, general manager for Petersen Onsite, based in Fredonia, Wis, also prefers precast.

"Financially, fiberglass tanks are just not feasible because they have to be customized," he said.



Precast concrete manufacturer Wieser Concrete Products applied a waterproof coating to the tanks as an extra layer of protection.

Cast-in-place concrete was never an option.

“With all the custom openings, inlets and outlets, it’s very difficult to maintain the quality with cast in place,” Birrittieri said.

FABRICATING FOR STRENGTH AND PRECISION

It’s not every day a precast concrete product manufacturer gets the opportunity to fabricate five 38,000-gallon and four 10,000-gallon precast tanks for one job. The larger tanks measure 14 feet wide and 40 feet long. The smaller ones are 12 feet wide and 20 feet long.

To create the clamshell-style tanks, Wieser Concrete Products, based in Maiden Rock, Wis., added a ConShield Technologies additive to its standard 7,000-psi concrete mix to help prevent corrosion. The tanks rely on a combination of post-tensioned cables as well as traditional steel reinforcement.

Most of the tanks use a Bio-Microbics FAST (Fixed Activate Sludge Treatment) aeration system, which is pre-assembled and installed in the tank bases at the precast plant.

“Then they just need to be hooked up at the site,” said Wieser Concrete Products General Manager Andy Winkler. “It saves a lot of installation time.”

As a last step, the tank elements were coated with a waterproof sealant.

“Wieser Concrete not only customized the tanks the way we needed them to be customized, but also did it affordably and increased the quality control as well,” Birrittieri said.

Also included in the project was a control building to house the pumps, control panel and a small room to store denitrification chemicals. The building’s 10-inch-thick precast concrete walls were fabricated with three inches of foam insulation sandwiched in the middle. The 16-foot-wide-by-8-foot-tall front and back walls weigh nearly five tons apiece, while the side walls measure 14 feet 4 inches wide by 8 feet tall and weigh 8,955 pounds each. A 12-inch-thick, two-piece, insulated precast roof tops the building. Wieser Concrete also fabricated two front overhang panels and two interior walls.

All of the elements for the control building were complete within two weeks.

CHALLENGING BUT SPEEDY INSTALLATION

Transporting the 38,000-gallon tank elements was challenging simply because of their sheer size and weight – the heaviest piece weighed 39 tons. Delivery trucks had to take special routes that could accommodate the large loads, and site conditions complicated access to the job site. With only one way in and out, coordination was crucial to keep deliveries in order. Despite this, all of the precast tanks were shipped in one day.

“We literally had to drive the trucks in, turn them around, unhook the trailers and use the crane to spin the trailer around so they wouldn’t have to back all the way out,” Winkler said.

Because of the sandy soil conditions, the crane’s reach needed to extend further than what would typically be required to



Photo courtesy of Petersen Onsite

Workers were able to set the tanks in one day.

maintain a safe distance from the excavation. Wieser Concrete solved this issue by using a 550-ton rough-terrain crane with eight loads of counterweights for stability.

“It’s very expensive, but we calculated the difference between moving a smaller crane multiple times or having one crane and leaving it in one location,” Winkler said. “The larger crane won out.”

Workers set all the tanks in one day. Then they connected the internal components and applied joint wrap at the mid-seam to seal the tanks. They also set the walls and roof of the control building the first day and installed the hardware the following day. The entire project installation was complete in two days.

“I don’t know how it could have gone any better,” Winkler said. “It was absolutely perfect.”

HOW THE SYSTEM WORKS

The treatment process begins when collected wastewater is pumped into the subterranean tanks to settle and equalize. It’s then recirculated through a large gravel filter before undergoing a denitrification process. Finally, the treated wastewater is transferred to a dose tank and allowed to drain into the ground. The system has a 55,000-gallon daily treatment capacity.

Replacing treated wastewater into the underlying aquifer replenishes the groundwater, keeping it local. It’s a more environmentally-friendly method than pumping wastewater into the river, where it is lost.

“The design of this system, with a large gravel filter and denitrification behind it, is unique,” Birrittieri said. “And the quality of the wastewater leaving the system is exceptional.”

TEAMWORK YIELDS SUCCESS

Two on-site pre-planning meetings helped the project go smoothly. And working together on previous projects was an undeniable bonus. Earlier this year, Wenck won a design award for the project from the Minnesota chapter of the American Council of Engineering Companies.

“All-in-all, it took seven years from planning, design and construction,” Miller said. “But in the end, we are very happy. The product is outstanding.” **PS**

Shari Held is an Indianapolis, Ind.-based freelance writer who has covered the construction industry for more than 10 years.

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Neither Rain nor Snow Keeps Precast Performing



Photo courtesy of Troy Lindsey, Photo LLC

Precast manufacturing clears away multiple construction headaches on a major infrastructure project in Suffolk, Va.

By Bridget McCrea

When the City of Suffolk, Va., set out to replace two of the roughly 15 bridge structures that had been classified as “structurally deficient and functionally obsolete,” the municipality didn’t realize what it was getting into.

“When we first got started, we figured it would be a breeze,” said Antonio Jordan, operations manager for the city’s public works department. “After all, these were just small, puddle-hopper-type bridges. We were going to get in there, do what we needed to do, and get out.”

It didn’t take long for reality to hit, and for the project to become much more complicated than the city could have predicted. Situated about 1.5 miles apart, the two bridges serve as vital conduits for area residents. And because they both spanned water, unpredictable elements like bad weather and some environmental concerns would force the city to rethink its original plans for replacing the structures.

EMULATIVE DESIGN

Initially, the city specified cast-in-place concrete structures to replace the antiquated bridges, which Jordan said were built in the 1950s. With about 130 total bridges located in Suffolk, the two in question both had weight restrictions and were constructed with the goal of bridging a swampy wetlands area. But as those bridges aged, they fell out of code. Repairing them started to get costly, according to Jordan, so the city knew that replacement was in order.



Photo courtesy of Troy Lindsey Photo LLC

“Both bridges are located in rural settings, so we had to worry about fire and rescue, school buses and other types of transit being able to get in and out of the areas that are served by those structures,” said Jordan, whose team wanted the replacement process to take no more than six to nine months, max.

Due to that time constraint, and the fact that cast-in-place could require extra permitting time (namely due to environmental/wetlands considerations), the city began to explore precast concrete structures as a viable option.

“We felt like we could really speed up the design process and get into the construction phase faster by switching from a traditional box culvert to a 3-sided precast one,” said Jordan, who worked with engineering firm Parsons Brinckerhoff during the process. “That way, we wouldn’t have to disturb the creek bed and hurt our chances of getting the environmental permit as fast as we did.”

BATTLING THE ELEMENTS

Using precast elements also allowed the contractor, Precon Marine of Chesapeake, Va., to work on the two bridges simultaneously. For example, just two months into the project, the company was able to finish up with some of its equipment on

the first bridge, and then move that equipment 1.5 miles down the road and use it on the other bridge.

Bryan Ellis, Precon Marine’s project manager, said it’s getting fairly common to see older infrastructure projects replaced with precast concrete structures. He said the precaster, Tindall Corp. of Spartanburg, S.C., provided a unique culvert design for the bridges that incorporated a 3-sided culvert with abutments on either side and a center pier.

“Tindall helped us convince the city the right way to do that was to also make their foundation pieces precast,” recalled Ellis, noting the original plans called for a 3-sided precast culvert to sit on top of a cast-in-place concrete footing. “With the schedule we were working on, the weather conditions, and other variables, we felt precast would save everyone time and money.”

AN ALL-IN-ONE APPROACH

Working with Precon Marine, Tindall Corp. provided a complete precast solution for Suffolk’s bridge projects. Tindall engineered, manufactured and delivered flat-top, three-sided bridge pieces, wing walls, headwalls and precast foundations. One bridge featured two three-sided bridge sections with a combined

span of 52 feet, and the other was a single three-sided structure spanning 30 feet.

The all-in precast approach, including the foundations, enabled the fast installation times the city wanted. Using an “emulative design” process, Tindall precasted the footings to closely mimic the original design.

“We could have made the footings smaller, but time just didn’t allow for it,” said Barry Phillips, sales manager for Tindall’s Utility Division. “So, we expedited the process by offering the [city] exactly what it already had in its plans.”

Phillips said the project kicked off with the precaster working with Parsons Brinckerhoff and Precon Marine during the bidding process. The project was unique in that it would involve a total precast solution versus one that simply incorporated various types of precast pieces. Phillips said one of the main reasons for using precast was the area’s weather conditions, which prohibited the wetlands from being drained enough to be able to pour the concrete footings.

“We offered them a solution to precast the footings with stem walls,” he explained. “That way, they were able to install the footings without having to try to pump it down or build a diversion in the area around the bridge.”

IT NEVER RAINS IN A PRECAST PLANT

Randy Price, Tindall’s technical sales rep, said one of the biggest advantages of using precast concrete for the two Suffolk bridges was its environmentally friendly qualities.

“We were trying to mitigate wetlands, where you always want to have minimal disturbance,” Price said. “So, instead of the typical normal bridge – with columns extending downward and interrupting the beautiful fish and crawfish in that gorgeous creek – this structure just spans the water.”

Making precast even more attractive in this situation was the fact that the components could be manufactured in advance, and in a temperature- and quality-controlled plant setting.

“When you’re getting bad weather and flooding that’s trying to raise a creek, you can’t cast in place, but it never rains under the roof of a precast plant,” Price pointed out.

As he ran his finger down the list of city bridges that need to be replaced or repaired over the next few years, Jordan said the success of these two projects will surely have an impact on Suffolk’s material of choice for upcoming replacements.

“We do have plans to do replacement of some of the bridges that are similar in size and in a rural setting just like these two were, and I’ve been instructing my design engineers to push wherever we can to utilize these types of precast structures,” Jordan said. **PS**

Bridget McCrea is a freelance writer who covers manufacturing, industry and technology. She is a winner of the Florida Magazine Association’s Gold Award for best trade-technical statewide.



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Thanks to its speed and cost-effective nature, precast concrete is a key component for U.S. infrastructure.

Mark Crawford

Photo courtesy of Utility Concrete Products



Photo courtesy of Utility Concrete Products

Six custom precast concrete units create a massive utility junction in Illinois. Installation of the junction took only 2.5 hours, minimizing disruptions to area residents.

Precast concrete is an essential and cost-effective building solution for maintaining U.S. infrastructure, particularly sanitary and storm sewer systems. For instance, Utility Concrete Products of Morris, Ill., recently completed a massive combined sanitary and storm sewer junction chamber for the Village of Lombard, Ill., that took a mere 2.5 hours to install. This vital piece of infrastructure allows easy access for municipal employees and engineers to the intersection of three sanitary/storm sewer lines as part of the Gatz Pond Outfall Improvements. The chamber measures 23 feet by 16 feet by 17 feet and weighs 193,000 pounds.

“Precision and timing were key since many of these sewers were active during installation,” said Tom Heraty, vice president of sales and engineering for UCP.

Taking this challenge into account, UCP and contractor Martam Construction selected a precast solution to replace the original cast-in-place design. The precast solution minimized disruptions and impacts to area residents.

EFFICIENT AND SPEEDY DESIGN

Design challenges for the junction chamber included pipe diameters, pipe orientations and pipe supports. The pipe diameters intersecting the structure range from 48 inches to 92 inches.

Pipe orientations provided challenges due to their angles. A traditional rectangular or circular structure could not accommodate the large pipe diameters and their associated angles. In plain view, the shape of the resulting chamber design consists of six custom precast units, the heaviest of which weighs 74,150 pounds, and resembles that of home plate. The 48-inch

pipe, which passes through the chamber, required a precast pipe support at mid-point. The crew maintained proper elevations for positive pipe flow during and after installation.

“We made sure to maintain balance at the lifting points, despite the odd shapes of these units,” Heraty said. “We also utilized bolts and bolt pocket formers to easily connect these units. The use of self-consolidating concrete ensured a uniform pour around the extensive reinforcement grid in each unit, with a final concrete compressive strength in excess of 6,000 psi.”

WELL PLANNED, WELL EXECUTED

Installation of the junction chamber went off without a hitch. UCP performed a mock installation at its plant to ensure proper fit between all units. This resolved any issues that could have arisen for the contractor during installation in the field.

“PVC sleeves in the roof slabs for dowel bars to be drilled and grouted in the field solidified the connection between the base and wall units and roof slab units,” said Heraty.

The contractor certainly appreciated the ease of installation – the entire process took about half a day, compared to the multiple days that would have been required for cast in place.

A group of municipal engineers, public-works employees, village employees and local officials watched the installation.

“Seeing the satisfaction on their faces was very rewarding,” Heraty said. “The chamber now gives city workers easy access to this important juncture of the sanitary and storm sewers, making it easier for the village to take care of the system.” **PS**

Mark Crawford is a Madison, Wis.-based freelance writer who specializes in science, technology and manufacturing.



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The term security wall may not inspire designers, but by no means do these **functional stalwarts** need to be boring.

Mark Crawford

Photo courtesy of Utility Concrete Products



Photos courtesy of Utility Concrete Products

Adding a stone texture to the precast concrete panels gave this Illinois substation an aesthetically-pleasing security wall.

When Commonwealth Edison Company hired Chicago-based contractor The BarTech Group to discuss security walls for a substation project in Romeoville, Ill., the utility company proved this point when they stressed the walls needed to be both secure and visually appealing.

The resulting design for the precast security wall around the perimeter of the station included 53 8-foot-tall precast columns

with 51 panels, spanning an average 19 1/2 feet in length. Each panel carried a smooth coping with a 3/4-inch reveal running the length of the panel. A special column cap design helped make the columns more attractive.

Utility Concrete Products of Morris, Ill., provided the precast units for the project. A formliner was used for the panels and columns to achieve the 1 1/2-inch reveal ashlar stone texture.



“The wall had several kink points throughout its length,” added Heraty. “This required custom columns with angled keyways to allow the panel to be properly connected and aligned.”

WORKING TOGETHER

A fabrication schedule established between UCP and the contractor maintained the installation date requirements of the owner. Predetermined delivery start times and spacings between trucks ensured the installation of the panels and columns occurred on time. Upon arrival at the job site, the columns were rotated upright and set on top of cast-in-place concrete piers so that the base plate holes in the columns aligned with the anchor bolts previously cast in the concrete foundations.

It was imperative that The BarTech Group accurately laid out the locations of the bolts to avoid any alignment conflicts in the field. Plastic shims between the top of the pier and bottom of the columns created a uniform bearing surface. The panels were then smoothly released through the keyways of the columns.

SAFE, SECURE AND STYLISH

When the walls were completed, the UCP team was proud of the solution that accomplished the security and design goals of the client, including a first-time use of the color gadget gray.

“We take pride in our ability to provide great-looking products while maintaining tight tolerances,” said Heraty. “During the design stage, without the benefit of seeing all the different components installed, it can sometimes be difficult to really see how the final product will look. The client was very pleased with our attention to detail and precision, and everyone thoroughly enjoyed the color scheme and the patterned precast walls.” **PS**

Mark Crawford is a Madison, Wis.-based freelance writer who specializes in science, technology and manufacturing.

“The walls are designed to provide added security for the substation, as well as be aesthetically pleasing for the surrounding community,” said Tom Heraty, vice president of sales and engineering for UCP.

Steel security fencing installed on top of the wall adds an additional 2 1/2 feet to the height of the wall and a steel gate is connected to embed plates in the adjacent columns.



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