

Precast Pavement Perfection // Banking on Precast // California's Precast Express

precast solutions

WINTER 2018

**THE
TRANSPORTATION
ISSUE**



precast solutions

WINTER 2018
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ON THE COVER:

Piles and Piles of Precast: How do you replace an important bridge that serves as the primary transportation route for island residents? Specify plenty of precast concrete. Thanks to a special, balanced cantilever design and precast components including box girders, piles, girders and more, the new Herbert C. Bonner Bridge in North Carolina's Outer Banks will boast a 100-year service life. Learn more about the project on page 16.

Photo courtesy of HDR.

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Specifier Q&A

This issue, Precast Solutions magazine sits down with **Matthew Filcek** of the **Michigan Department of Transportation** to discuss his involvement with precast concrete products and projects.

All photos courtesy of Michigan Department of Transportation.

Name: Matthew Filcek

Title: Structural Fabrication Engineer

Company: Michigan Department of Transportation

Professional Designations: P.E.



Q: What is your field of focus and what particular products do you specialize in?

A: I received my master of science degree in civil engineering with an emphasis in structural engineering from Michigan State University. I began my career working for the Michigan Department of Transportation as a bridge design engineer for about seven years, then worked as a geotechnical engineer for two years before spending the last six years as MDOT's structural fabrication engineer. MDOT's Structural Fabrication Unit focuses on bridge and highway transportation-related structures such as the following non-prestressed precast concrete elements:

- Culverts
- MSE walls
- Sound walls
- Prefabricated bridge element systems (footings, piers, abutments and bridge decks)

Q: What are the benefits of using precast concrete products?

A: Precast concrete products give MDOT the ability to expedite project schedules, reduce work occurring on or near the roadway, and reduce user delay impacts to the public.

Q: What are some unique or interesting projects on which you specified precast concrete?

A: MDOT has many success stories with precast concrete, including precast bridge element systems used to accelerate bridge construction. One particular project featured a precast abutment that included voids to allow pile foundations to pass through. The precast abutment was connected to the pile foundation using ultra high performance concrete.



Filcek explained that using precast concrete products allows MDOT to expedite project schedules.

Q: How have you seen precast concrete evolve? How do you see it continuing to impact your work?

A: We have witnessed precast concrete evolve to include options for more geometries, higher strengths, longer spans and improved durability. Precast concrete continues to be a solution for accelerated construction as MDOT strives to provide the highest quality integrated transportation services for economic benefit and improved quality of life. **PS**



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A night-time photograph of a construction site on a highway. Several workers in high-visibility vests and hard hats are gathered around a concrete structure. A large, bright, oval-shaped light on a stand illuminates the scene. A bucket of 'CHAPIN' brand material and a red generator are visible on the ground.

Precast Pavement Section

The Interstate 210 Foothill Freeway in Los Angeles gets a new lease on life thanks to a complete precast concrete overhaul.

By Bridget McCrea

All photos courtesy of Oldcastle Precast.



Oldcastle Precast manufactured 6,500 precast concrete pavement panels for the Foothill Freeway project in California.

Time after time, precast concrete has been proven the material of choice when replacing our nation's roadways. Offering strength, durability, fast installation times and a controlled manufacturing environment, precast was the material of choice when the California Department of Transportation (Caltrans), undertook one of the largest pavement and slab replacement projects in the nation.

Situated just north of Los Angeles, the \$148 million Foothill Freeway (Interstate 210) project kicked off in April 2015 and encompasses about 10 miles of freeway. Kirsten Stahl, P.E., acting chief for the Caltrans Office of Engineering Services, said her department was responsible for scoping the work, funding the project and awarding the bid.

Built in the late 1960s, the Foothill Freeway had exceeded its

design life, according to Stahl, and over the last few years had become a popular route for commuters and truck drivers.

"A lot of vehicles trying to bypass the downtown LA area use 210 as a bypass," she said. "As a result, it's really gotten beat up."

That's likely because the road wasn't built to withstand the high volume of traffic that relies on the bypass. Over the course of time, it fell into disrepair.

"In some places, the pavement was completely shattered," Stahl said.

PRECAST AT THE MAINTENANCE LEVEL

Having withstood roughly five decades of use, the Foothill Freeway is now getting a new lease on life, and the commuters who rely on it suffered minimal delays or detours thanks to a



well-orchestrated installation process. Stahl credits a “progressive maintenance superintendent” from Caltrans with pioneering the use of precast concrete for such a project.

“We were lucky,” she said. “He wanted to use something that he felt would be more effective, so he started [experimenting] with individual precast slabs to replace existing pavement.”

And with that, Caltrans made its first foray into using precast pavement at the maintenance level. After several projects were successful, Stahl said the superintendent expanded his vision to include other Caltrans projects – one of them being the Foothill Freeway.

“It’s an interesting project because it has so many pavement alternatives,” she said, noting that individual contractors had even added a few extra pavement alternatives, but that the “plain-



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Panels were fabricated in a new, 500-foot self-stressing bed.

jointed precast pavement” stood out as the best possible option.

The contractor that won the project bid, Flatiron West Inc., was familiar with the use of precast for highway construction and replacements. Stahl explained that the company knew to place the base very accurately and to the correct depth, and then place the panels “like tiles sitting atop the treated base.” This attention to detail minimized the amount of grouting that had to be performed after the fact.

“They were able to get the panels together nice and tight, which is what we look for so that we don’t encounter joint problems at a later date,” Stahl said.

CAREFUL COORDINATION

Manufactured by Oldcastle Precast, the panels for the I-210 replacement were produced over an 11-month span at a rate of 30 panels per day. In total, the precaster manufactured 6,500 precast concrete pavement slabs, each of which measured 12.5 feet wide by 11.33 feet long by 12 inches thick.

Oldcastle, which was awarded the project via public bid, worked with Flatiron West’s engineers to come up with proposed modifications before moving forward with the project.

“We found a few ways to improve the processes of installing and connecting the panels,” explained Phil Felton, Oldcastle’s vice

president of sales. “Those changes were incorporated into the design, approved by Caltrans, and then ultimately used both for the manufacture and installation of the panels.”

Felton said that early coordination among the precaster, contractor and project owner helped ensure a smooth process for the major highway replacement.

“The job went well in large part due to this collaboration,” he said. “We all worked together to come up with design- and project-specific solutions.”

To handle production, the precaster purchased a new, 500-foot self-stressing bed. Transportation was a particularly critical point due to a limited window for on-site product delivery.

“We knew that we needed a partner trucking company that could deliver the panels so that they could be installed the same night,” said Felton, who estimates that Oldcastle delivered anywhere from 40-to-50 panels each night.

That schedule presented some logistical challenges for Oldcastle, because the plant is located roughly 60 miles from the highway. As a result, some of the deliveries were round trip, with drivers offloading at the job site and immediately returning to the plant for a reload and a subsequent trip back to the site.

“We had staff members standing by, ready to load the trucks back up, and full-time project managers overseeing every



Workers installed the panels during overnight work windows, limiting the impact on traffic.

delivery,” Felton said. “It took a lot of careful coordination to make all of this work night after night, and without any problems.”

KEY BENEFITS

Over the last few years, precasters like Oldcastle have seen an increasing number of precast pavement slabs being specified and used to repair highway lanes and/or upgrade older lanes on U.S. roadways. Driven by benefits like reduced traffic congestion, shorter project durations and increased safety, organizations like Caltrans appreciate the fact that highway slabs install quickly, last an estimated 50 years and can be installed in any weather.

This method reduces impact to the public, and especially to commuters. On the I-210 project, for example, the overnight installation process required the highway to be closed at approximately 9 p.m. At that point, workers cut out the deteriorated sections and placed a lean concrete base into the opening. Once the concrete base reached the required strength (approximately one hour later), the precast concrete pavement slabs were installed, and the highway was reopened for full traffic by 5 a.m. the next morning.

“By using precast, we were able to get the road reopened to traffic sooner, which is a benefit to everyone,” Stahl said. “It gets the contractor off the road with less exposure to the public during peak

traffic. And, the public gets its roadway back sooner, with fewer traffic delays and congestion on an otherwise very busy route.”

From a longevity standpoint, Stahl said Caltrans really appreciates the high level of quality control afforded by precast concrete.

“Not only is it manufactured with high quality control standards in the plant, but you also get additional reinforcement from the prestress which, in turn, adds to the life of the concrete pavement,” she said.

A POSITIVE EXPERIENCE

As the person who everyone calls when something goes wrong or challenges crop up on a Caltrans roadway project in her region, Stahl explained she’s received very few calls related to the I-210 replacement project. That’s music to her ears.

“As far as I can tell, everything has gone really well,” she said. “I drive a portion of that highway myself, and I can see the progress that’s being made and how much smoother and nicer the lanes are.”

In retrospect, Felton said the early collaboration among the three key entities involved in the undertaking helped ensure a successful outcome.

“There was a lot of early planning and coordination,” he said.

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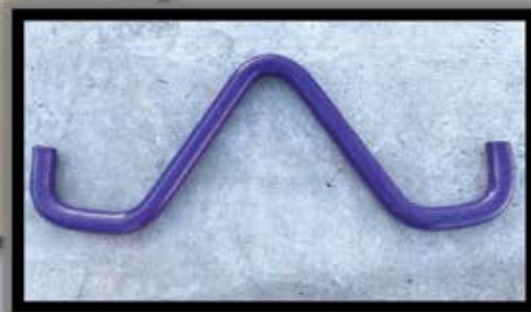
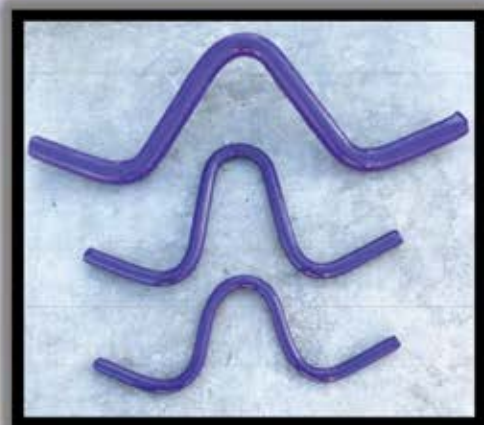


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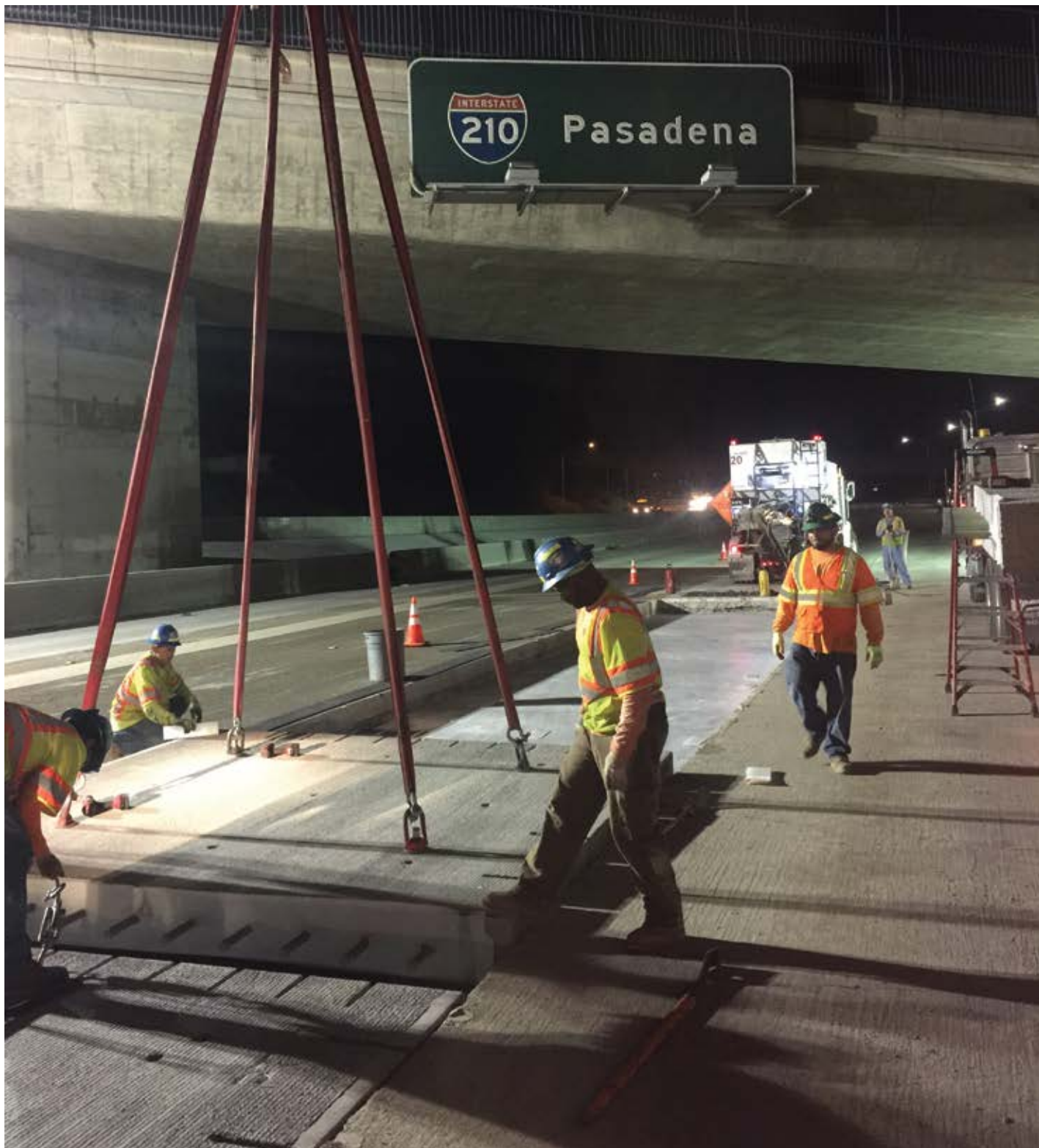
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“In some cases, we were talking several times a day.”

And if it's any indication of the project owner's satisfaction with the outcome, Felton said the precaster just signed a contract for another 3,000-panel roadway project on Interstate 5 near Castaic Lake in northern California.

“Obviously, the experience was positive enough that Caltrans

wants to replicate it on another highway, and we signed up for it again.” **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 feature statewide.

Banking on Precast

A variety of precast concrete products will offer the new Bonner Bridge in North Carolina a 100-year service life.

By Mark Crawford

All photos courtesy of HDR.





According to the 2017 Bridge Report by the American Road & Transportation Builders Association, more than 185 million vehicles cross nearly 56,000 structurally deficient bridges every day in the U.S. As such, deteriorating bridges are a big part of the country's ailing transportation infrastructure.

Bridges play a vital role in connecting communities. They serve as the main route for delivering products and supplies and connecting residents to their jobs. They also provide the only evacuation route when disaster strikes. These links are particularly important for island residents. For them, bridges are more than just a crossing – they are a lifeline.

Take, for example, the Herbert C. Bonner Bridge, which connects Hatteras Island and Bodie Island in the Outer Banks of North Carolina, providing a critical transportation link for the area's coastal communities. More than 50 years old, the bridge serves as a hurricane evacuation route to the mainland and a busy travel corridor for the state's tourism industry. Due to severe

deterioration and scour problems created by the strong Atlantic Ocean currents, the North Carolina Department of Transportation decided to replace this critical structure. In 2011, NCDOT teamed up with PCL Civil Constructors of Denver, Colo., and HDR of Omaha, Neb., on a new, 2.8-mile, \$246 million replacement bridge with a 100-year service life.

BALANCED CANTILEVER DESIGN

The new bridge incorporates a balanced cantilever design – a preferred method for constructing long-span precast concrete bridges across challenging terrain where topographic or geotechnical conditions make conventional formwork unfeasible. The centerpiece of the design is a 3,550-foot-long, 11-span, segmental concrete box girder bridge. The bridge includes nine 350-foot spans, each of which can accommodate the shifting position of the navigation channel through the ever-changing Oregon Inlet. In comparison, the original bridge provides only



The new Bonner Bridge incorporates a balanced cantilever design featuring a wide variety of precast concrete products.

one navigational span with an opening of 130 feet. Bridge supports include a total of 673 pilings, ranging in length from 110 feet to 130 feet, manufactured by Coastal Precast Systems of Chesapeake, Va.

“The highly dynamic environment proved to be one of the most challenging aspects of the project for both the designers and the contractor,” said Domenic Coletti, principal bridge engineer for HDR.

Varying conditions across the Oregon Inlet led the design team to divide the bridge into five “regions.” Each region has a design customized to its subsurface and scour circumstances. Each design uses time-tested methods and a specific assortment of simple but reliable structural elements including piles, pile caps, girders and bents.

“The final design capitalizes on the use of repetitive precast concrete structural elements to improve constructability, quality and durability – key criteria for such a harsh marine environment,” added Coletti. “This approach led to maximum

optimization of the design, allowing the contractor to develop an extremely competitive construction bid.”

THE PRECAST ADVANTAGE

Factors such as the harsh and corrosive ocean environment at the construction site, limited access, constrained easements, the remote location and an aggressive construction schedule made it easy for the design-build team to select precast concrete as the solution for the Bonner Bridge. Precast components include prestressed piles, bent caps, post-tensioned columns, prestressed Florida I-Beam girders and post-tensioned segmental box girder spans.

“Precast concrete provides unmatched quality and durability,” said Sean Bush, construction manager for PCL. “Since fabrication is performed at an off-site precast yard under controlled conditions, precasting achieves a higher level of quality and durability than would have been possible with cast-in-place in this



The massive structure includes nine 350-foot spans.



harsh marine environment, which is subject to a constant barrage of salt-spray wetting and drying cycles.”

The extensive use of precast concrete also helps address serious site-access challenges. The bridge is in a remote, environmentally sensitive location with only two-lane state Highway 12 available for overland deliveries. Consistent, timely delivery of large quantities of concrete for cast-in-place operations would have been challenging, especially during busy summer months with high tourism traffic.

“It proved much easier to transport already fabricated precast elements to the site,” Bush added.

Also, with much of the area designated as a submerged aquatic vegetation habitat, environmental sensitivity is a top concern.

“Minimizing field construction work, construction duration and the placement of cast-in-place concrete on-site through the use of precast concrete is an environmentally friendly approach, reducing the duration and extent of temporary environmental impacts,” said Nick Amico, senior bridge engineer for HDR.

Precast concrete offered other advantages for addressing environmental constraints. For example, drilled shaft construction was considered impractical due to restrictions on soil disposal in the environmentally sensitive area. The highly corrosive environment also precluded the use of steel piles. Only precast piles could address all of the environmental challenges for the foundations.

Use of precast elements also provides significant economical and schedule savings. Off-site fabrication is much less costly compared with delivering and placing cast-in-place concrete in the remote project location.

“Precasting also shortens the overall construction schedule by permitting manufacture of components while precursor operations are underway,” Coletti said. “This minimizes the field construction work required from barges and the work trestle, leading to much faster and more streamlined construction.”

To reduce the need for future maintenance and repairs, NCDOT specified numerous prescriptive durability criteria for achieving a 100-year service life. Requirements included using:

- Stainless steel reinforcing in all cast-in-place concrete
- Stainless steel post-tensioning in substructures up to 12 feet above mean high water
- Stainless steel bearing sole plates
- 99.99% aluminum metalizing of other steel elements
- Robust concrete mix designs with high percentages of fly ash or ground granulated blast furnace slag
- Low water-cement ratios
- Silica fume
- A calcium nitrite corrosion inhibitor admixture

“These concrete mix designs greatly enhance the durability and longevity of all concrete elements of the bridge,” Amico indicated.



Thanks to the use of precast, the new Bonner Bridge will boast a 100-year service life.

ON-TIME COMPLETION EXPECTED

NCDOT broke ground on the Bonner Bridge replacement on March 8, 2016. Construction started in three areas: the south approach, the north approach and navigational spans. After completion of the north and south approaches, work will begin on the sections that connect each end with the high-rise portion, also known as the navigation zone. The new bridge will open to traffic in November 2018, with demolition of the existing bridge completed by September 2019.

The extensive use of precast concrete will result in an extremely durable, high-quality structure, while simultaneously

contributing to greater constructability, a shorter timeline, lower overall costs and an environmentally friendly construction process.

“Precasting the majority of the structural elements allowed for extensive fabrication off-site, under controlled conditions, which naturally improves the quality and durability of these elements,” Amico said. “The extensive use of precast concrete elements also allows for faster, easier, more streamlined construction in the difficult, dangerous conditions found in the Oregon Inlet. Also, any prestressed concrete elements are subject to a zero-tension design requirement under service conditions, further contributing to the enhanced longevity of the new bridge.”



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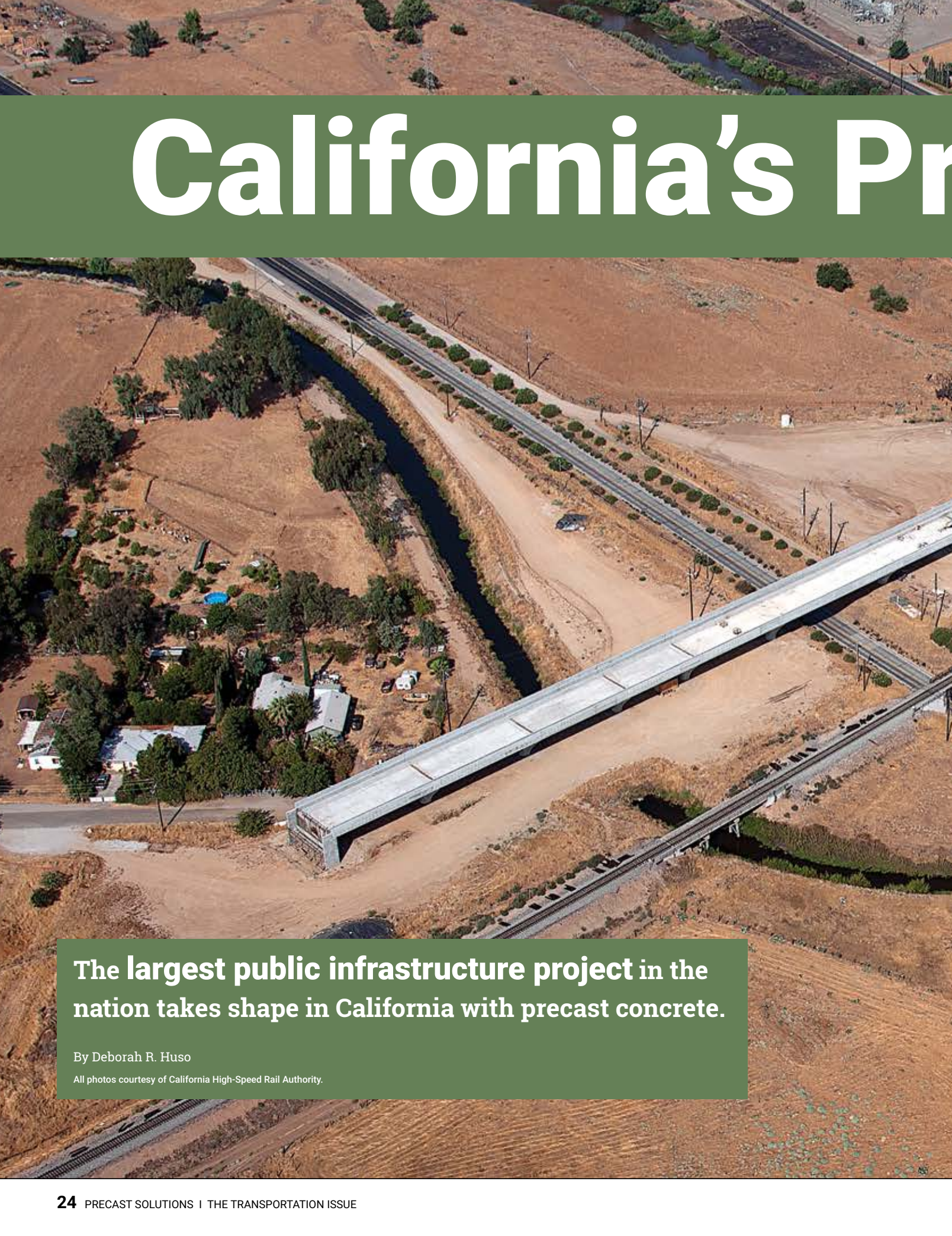
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After more than two decades of planning, the completed bridge will provide a revitalized connection for Outer Banks residents and visitors.

“The bridge will improve access to jobs, health care, education and recreation for the community, while also benefitting local tourism and feeding a robust economy,” Amico said. “Despite the many challenges of such a unique and complex site, once completed, this impressive structure will provide NCDOT, local residents and innumerable vacationers with a safe, durable crossing for the next century.” **PS**

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



An aerial photograph showing a long, elevated concrete bridge spanning a river. The bridge is constructed from precast concrete segments. The surrounding landscape is arid and brown, with some green trees and shrubs along the riverbanks. A road and some residential buildings are visible on the left side of the river.

California's Pr

The largest public infrastructure project in the nation takes shape in California with precast concrete.

By Deborah R. Huso

All photos courtesy of California High-Speed Rail Authority.

recast Express







Joint venture firm Tutor Perini/Zachry/Parsons selected precast concrete to save time and increase efficiency on the California High-Speed Rail project.

Traffic congestion has been an issue in California for decades. However, there may finally be light at the end of the tunnel for Golden State commuters. After more than four decades of proposals and controversies, the California High-Speed Rail project is underway.

First proposed in the 1970s, the high-speed rail system will stretch 800 miles from Sacramento to Los Angeles. Construction began in 2017, making it the nation's first high-speed rail project and its largest public infrastructure project ever.

Phase 1 is currently underway and covers 32 miles of the proposed rail line, beginning in the southern portion of Fresno County, running into Madera County and ending at Avenue 17, according to the California High-Speed Rail Authority (HSR). Design work on the first phase began in July 2015, with completion scheduled for August 2019. To ensure a timely, high-quality installation, the project will incorporate many precast concrete products.

PRECAST DELIVERS ON A TIGHT SCHEDULE

Steven Milton, an HSR design and construction manager, indicated the project had 14 construction sites underway at press time. Given the amount of ground the project has to cover in a

relatively short span of time, precast concrete has been critical to maintaining a tight and continuous design and construction schedule.

In fact, the rail line is being designed and built simultaneously with joint venture firm Tutor Perini/Zachry/Parsons (TPZP) serving as the design-build team for Phase 1.

"TPZP went with precast for time savings," said David Vallejos, a design-build oversight manager for HSR, adding that bridge and deck panels can be built off-site while foundation work is underway at the various construction sites. "Having a controlled site with better quality control also lowers labor costs."

Precast concrete is being used in many ways, including bridge girders, deck panels for bridges, beams for the pergola that will span the Union Pacific Railroad track and San Joaquin River, embankment supports, struts in trench sections, storm drains and water drains.

According to Brent Koch, chief engineer for Con-Fab California LLC, Con-Fab is manufacturing concrete bridge girders and partial-depth, stay-in-place deck panels for approximately 40 different structures on the project.

The girder style is the California wide-flange – a new shape the state adopted in 2011. The pergola, which includes the largest



Project precaster Con-Fab California is manufacturing more than 2,000 precast concrete components for the HSR project.

precast pieces on the project, is part of the San Joaquin River viaduct. It's a bulb-tee and includes 198 girders.

Milton said the team has benefited from the repetition of shapes on the project, noting that there are more than 700 girders but only 13 shapes.

According to Vallejos, the precast girders vary in length from 48 to 177 feet. Meanwhile, the prestressed beams spanning the Union Pacific tracks are about 200 feet long and 160,000 pounds each. There are 196 of them in this phase.

REPETITION FOR SPEED, COST-EFFICIENCY

Koch said all the precast components Con-Fab is manufacturing are fabricated using steel formwork. The same forms can be employed for all the wide flange girders.

"The formwork can be modified to different girder depths," he explained. "It's split longitudinally, so we can put in filler pieces to make the components shallower or deeper."

Meanwhile, 3.5-inch-thick precast concrete panels form the lower half of the bridge deck. According to Koch, there are approximately 100 deck panels for every bridge.

In all, Con-Fab is manufacturing more than 2,000 precast concrete components for the HSR project. The biggest precast

piece is the girder for Avenue 9, which is 177 feet long, 7 feet, 6 inches deep and weighs about 210,000 pounds.

With the repetition of the forms and the ability to build components in the plant at the same time work is progressing in the field, the design-build team is able to increase project speed and efficiency.

Reeve Trucking Company Inc., based in Stockton, delivers the precast components to the construction sites.

"They have specialized hauling equipment," Koch explained. "Large pieces are always a challenge."

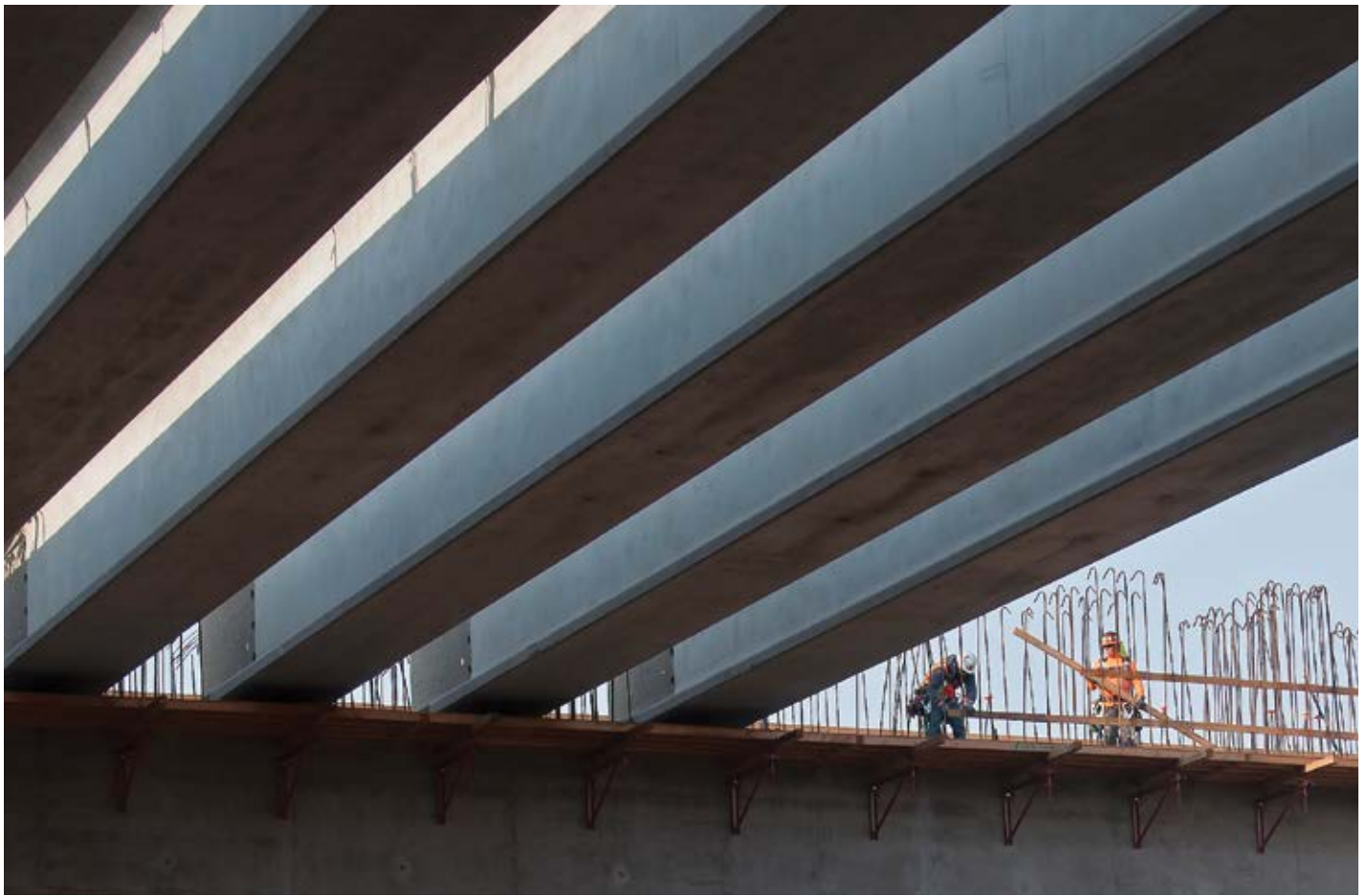
Con-Fab collaborates with TPZP as well as Caltrans and Union Pacific Railroad where necessary to plan transport routes pre-delivery.

"We have to make sure we have proper access to get off the highway and onto the job site," he said.

Vallejos agreed, noting the design-build team hasn't faced any significant hurdles with the HSR project.

"So far, the only challenge they've encountered involves the logistics of getting the large beams to the San Joaquin River," he said. "You have to schedule times with the railroads to get a construction window and get escorts."

Koch agreed, explaining that the production work has been



With the use of precast products, the high-speed train will run up to 220 mph when completed.

without difficulty to date. While Con-Fab has been building bridges in California since the 1980s, he said the HSR project represents the most casting the firm has done for a single project. Koch also added that it has been difficult keeping up with changing priorities and schedules at times, but noted communication has been key.

“We had the opportunity to have a seat at the table with TPZP from the beginning,” he explained. “That was very beneficial to coming up with streamlined designs and staying organized.”

The high-speed train – which will run up to 220 mph – will begin accepting passengers as early as 2025. When the project is completed in its entirety, it will take passengers from San Francisco to LA (approximately 400 miles) in as little as 2 hours and 40 minutes. **PS**



Deborah Huso is a freelance writer specializing in construction, real estate, finance and agriculture.



The New Information Superhighway

Precast concrete pavement slabs and integrated technology are a winning combination for the future of roadways.

By Shari Held All photos courtesy of Integrated Roadways.

The term “information superhighway” was introduced in the 1990s. Back then, it was used to describe a worldwide communications network. Today, Kansas City, Mo.-based Integrated Roadways is putting a different spin on the term. The company’s innovative Smart Pavement system, which integrates advanced technology with precast concrete pavement slabs, has the potential to revolutionize the way our roads are built and financed.

“We look at Smart Pavement as a computer in a concrete case,” said Tim Sylvester, founder and CEO of Integrated Roadways. “What we deliver is a sensing system that turns the pavement into a touchpad, but instead of fingertips, the sensing system is looking for tire positions.”

Smart Pavement technology can potentially alert drivers to real-time traffic and road conditions, inform authorities of accidents and melt ice on the roadway. It could also provide Wi-Fi, automatically charge electric vehicles, and communicate directly with autonomous and self-driving vehicles and smart cities. And Sylvester, who has been awarded one U.S. patent and received

publication notices for two others, has only begun to tap into the possibilities.

And, it’s affordable. Sylvester’s banking on the fact that Smart Pavement will be virtually self-funding in the future, generating income from the sale of data or network space to third parties.

PRECAST: THE FUTURE OF ROAD BUILDING

While serving as a project manager for a construction company, Sylvester observed two things. First, the rate of completing a project significantly impacted profitability. Second, the biggest factor out of the construction company’s control was how quickly the infrastructure could be built.

“Because of that, I became interested in the process of how to build roads better, faster, cheaper,” Sylvester said.

At the same time, public agencies were beginning to field requests for advanced technology capable of supporting smart cities and connected electric, autonomous and self-driving vehicles.



Integrated Roadways worked with the University of Missouri-Kansas City on a pilot project that was completed in just five hours.

perhighway

Sylvester soon discovered using precast slabs lowered the total cost of ownership, extended the road's service life and shaved time off the construction process. Plus, technology could be incorporated in precast more economically than with cast-in-place concrete or asphalt.

"That's when I decided precast was going to be the future of road building," Sylvester said.

In 2006, Sylvester founded Integrated Roadways and was prepared to set the world on fire, turning his concept into reality. But he quickly discovered he didn't have the credentials to sell his product. Undaunted, he returned to the University of Missouri and earned a combined electrical and computer engineering degree.

SMALL INROADS

Sylvester's biggest challenge was getting public agencies to recognize there were new options available for building roads. His first goal when he came back to Integrated Roadways full time was twofold: prove the superiority of precast pavement versus

cast-in-place concrete or asphalt, and demonstrate that Integrated Roadways had the know-how to build a "standard" precast roadway.

"We figured we wouldn't be able to establish the credibility we needed for the advanced technology until we had demonstrated that the means and methods of constructing the pavement system were valid, economical and repeatable," Sylvester said.

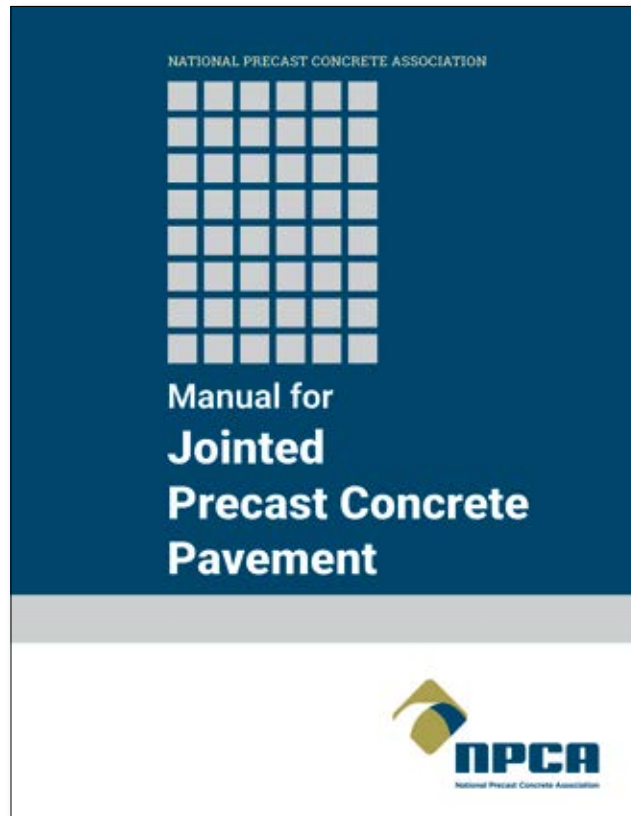
The company's first opportunity was to provide two precast jointed slabs on an Interstate 35 repair project for the Missouri Department of Transportation.

"Our finished joint repair actually ended up being smoother than the cast-in-place joint repairs that preceded it," Sylvester said.

In 2013, Sylvester's alma mater hired Integrated Roadways to provide a 22-foot-by-200-foot continuous precast pavement section as part of the new Bloch Executive Hall project.

Instead of the estimated two-day completion time, the crew completed installation in just five hours – proving how quickly a precast road could be built.

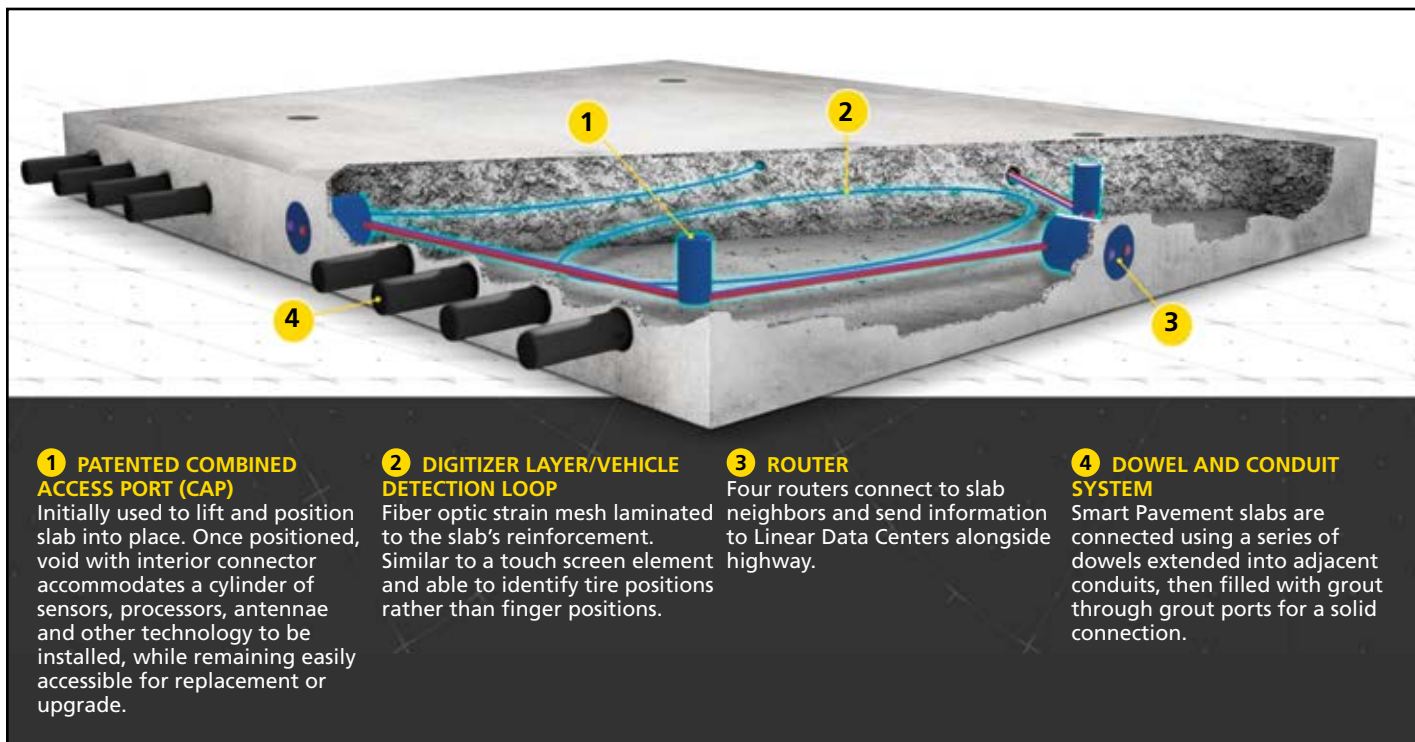
Manual for Jointed Precast Concrete Pavement



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- Maintenance of completed installations

View the manual now at precast.org/jpmanual



This rendering depicts the various technology which can be incorporated into an Integrated Roadways precast panel.

A BUMP IN THE ROAD

Riding high on the success of the Bloch Executive Hall project, Sylvester started working with Kansas City and the states of Missouri and Kansas to identify additional work.

Although public agencies recognized the advantages of precast Smart Pavement, they were hamstrung by a lack of funds and outdated procurement processes, which require them to select a low bidder.

At the same time, they were beginning to field requests for advanced technology capable of supporting smart cities and connected electric, autonomous and self-driving vehicles, but Sylvester found advanced technology was typically limited to 1% to 3% of the value of a total project.

A new financial model was needed. So, Sylvester went back to the drawing board and looked to internet giants Facebook and Google for inspiration.

“Advanced technology enables an abstraction of the financial model to where the person receiving the benefit isn’t necessarily the person paying for the service,” Sylvester said.

From there, it wasn’t a huge leap to theorize that Integrated Roadways could finance the construction of the roads by selling the data it would collect and space on the networks it would build. Potential customers include data and sensor companies, wireless carriers, wired network providers, advertisers, insurance companies and real estate firms. Using this model, it’s possible that neither public agencies nor the general public will have to pay for our roadways in the future.

“Now we approach DOTs and departments of public works with a much different offer that isn’t in competition with the way they do things now,” Sylvester said.

Integrated Roadways currently has two potential pilot projects lined up – one in Colorado and one at an undisclosed location in the Midwest.

PRODUCING SMART PAVEMENT

While selling public agencies on the concept of Smart Pavement, Integrated Roadways was simultaneously developing a manufacturing process for the product.

The company designs the pavement system, the network and the electronics. But everything else – from the engineering firm to the installer – is local to ensure compliance with local codes and regulations.

“Qualified, certified precast manufacturing facilities exist throughout the nation,” Sylvester said. “That makes it very easy for us to show up in a new region and begin providing product.”

Although the contract for the Colorado pilot project hasn’t been signed, Wichita Concrete Pipe, the precast provider, is getting geared up to produce the prototype elements.

Workers will use a wet-cast process to fabricate 250 test panels. First, the panel is formed using steel molds. The electronic components, fiber-optic elements and steel rebar are then placed in the locations specified by the shop drawings. Then, concrete is cast around the elements.

Although the dimensions haven’t yet been finalized, Brad Werth, vice president of Kansas-based Wichita Concrete Pipe,



Early pilot projects have proven the speed with which precast pavement systems can be installed. Future endeavors will focus on the inclusion of integrated technology.

anticipates each slab will measure 10 feet by 12 feet and weigh approximately 6 tons.

Only the passive elements – the power distribution, communications networks and sensing components that make the road touch-sensitive – are physically embedded in the precast. These are unlikely to wear out or become outdated. Active components that operate the passive systems will be placed in accessible modules for easy upgrading.

Werth anticipates making 10 slabs per day for the pilot project.

Sylvester estimates most projects will follow an 80/20 model, with 80% of the slabs falling into a small, standard set of slab types and 20% being custom-produced to accommodate specific variations in the grade and road path.

Werth has high hopes the pilot will be a success.

“If the concept proves out, we think it will be used all over the United States,” he said. “We think there’s real opportunity with this product.”

PUTTING THE RUBBER TO THE ROAD

Colorado will showcase the first national deployment of Smart Pavement. The pilot project is a quasi-public/private partnership between Integrated Roadways and RoadX, a Colorado Department of Transportation Program.

“RoadX is all about finding new opportunities and demonstrating – often on a smaller scale – that they work or bring value, so other DOTs have a higher level of confidence that they’re making a solid investment,” said Peter Kozinski, P.E., director of the RoadX Program.

One of the state’s priorities is getting its roads ready to communicate with connected and autonomous vehicles.

“In the early stages, that’s going to require our roads and our infrastructure to provide information to vehicles,” Kozinski said. “That data will also allow us to utilize our roads to a higher level of efficiency.”

For this pilot project, Kozinski wants to ascertain how well Smart Pavement technology can detect when a vehicle leaves the road at an unsafe speed and trajectory, and have the pavement notify emergency responders when it detects such an event. The test location is a treacherous, one-mile stretch of state Highway 285.

“The pavement has a lot of other potential capabilities, so we want to understand all the features,” Kozinski said. “But if this technology can inform us of potentially unsafe conditions or accidents, that fulfills our mission of keeping our citizens safer – it’s a good investment now.”

Construction is anticipated to begin in the spring and to be completed by late summer/early fall 2018. A successful project will provide Integrated Roadways with the proof of concept Sylvester needs to gain acceptance for Smart Pavement.

DRIVING TOWARD THE FUTURE

Despite its unproven status, Sylvester is optimistic about Smart Pavement’s potential to revolutionize our roadways, much like the internet revolutionized the way we communicate.

“Although treating the road as a network for advanced mobility might seem like a mind-bending leap forward, we can’t hold ourselves back by doing things the way we’ve always done them,” Sylvester said. “We need to look forward and plan for the future because infrastructure lasts for decades.” **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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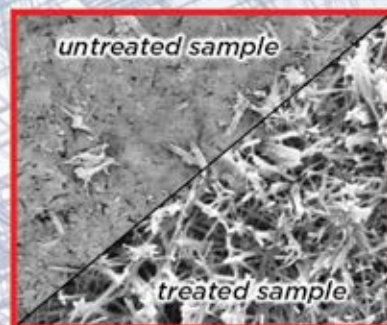
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