Saving Lives with Precast / Cruise Control / Peculiar Precast

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ON THE COVER:

Full Speed Ahead: To counteract a compressed construction schedule, LEO A DALY and Turner Construction turned to precast concrete in the build-out of Royal Caribbean's new Innovation Lab. Discover how a variety of precast products served as the perfect solution for the new, high-tech addition to Royal Caribbean's headquarters in Miami on page 16.

Photo courtesy of Robin Hill

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Saving Lives with Precast

Newly developed precast concrete **emergency shelter** has the potential to **save thousands of lives.**

By Shari Held





STATIM (Storm, Tornado, and Tsunami Interconnected Module) shelters are designed to provide protection from natural disasters for 50 people.

N atural disasters can have devastating consequences. One of the deadliest, the 2004 Indian Ocean earthquake and tsunami, claimed more than 200,000 lives.

"I remember being shocked by those images," said Miguel Serrano, principal of Brahman Developments, a company based near Fort Lauderdale, Fla., that specializes in upscale residential construction projects.

Inspired by the event, Serrano pooled his resources and connections – including structural engineers, naval engineers and others – to develop a precast concrete shelter that would protect those affected by natural disasters.

STATIM IS BORN

The result of that collaboration is the STATIM (Storm, Tornado, and Tsunami Interconnected Module) shelter. Each module provides protection for 50 people and contains two weeks of emergency supplies, batteries, solar power and communication technology for tracking purposes.

Speaking with Serrano reveals his passion for and dedication

to the shelters. He relocated Brahman Developments from Puerto Rico to south Florida, founding Brahman Industries to handle development.

"I moved to Florida specifically because it has the casting plants and a robust maritime industry infrastructure and resources such as high-capacity gantry cranes, which are needed to handle completed shelter units for water trials and destructive testing," he said.

Though still in development, STATIM has already received a U.S. patent and has 14 other patents pending from other countries. Worldwide, big hopes and expectations are riding on STATIM shelters.

Many shelter concepts have been advanced prior to STATIM, but none are of the size and scale appropriate for community and government applications.

"If they are strategically fielded and implemented, they could save tens of thousands of lives, if not hundreds of thousands," said Dr. George Pararas-Carayannis, president of Tsunami Society International.



Each of the shelter's four precast concrete modules will be 13 feet in diameter and 10 to 12 feet long.

PRECAST IS THE ANSWER

Serrano knew his concept for the STATIM shelter had to be simple, durable and affordable. It needed to rely on readily available materials and unskilled labor to be easily manufactured worldwide. And it had to be strong enough to survive the impact of the initial tsunami wave while providing occupants with a minimum of two weeks of supplies.

Initially, Serrano and his collaborators considered constructing the STATIM from aluminum. That idea was nixed because it was too expensive and required special skills to produce. The same went for steel, which also had corrosion issues. Fiberglass and carbon fiber were also discussed, but both were too lightweight to survive the acceleration of the first wave of a tsunami.

While the team continued working on development, Serrano happened to watch a documentary about the manufacture of large-diameter, precast concrete sewer pipes. The film served as the catalyst for his aha moment.

"That's when I said, 'Hey, rebar and concrete is the way to do

it – it's inexpensive, there's no highly skilled labor needed and materials are available everywhere," Serrano said. "It's got to be concrete!"

BUT WILL IT FLOAT?

On paper, concrete was the best material for the job, but would it float? To find the answer, Serrano consulted with Anthony Martinez, P.E., of Martinez Marine Design, a Houston-based naval architecture and marine engineering firm.

"In the beginning, I suggested Miguel use a material other than concrete," Martinez said. "Large ships are almost exclusively built from steel. Concrete vessels are certainly contrary to a lot of traditional thinking."

Martinez worked with Serrano to review the design of the module's cylindrical shape and stability. He calculated not only whether the proposed precast structure would float, but whether it would remain in an upright position and be able to maintain that level of buoyancy.



This cross-sectional view depicts the many resources available inside a STATIM shelter.

The dimensions were instrumental in making the precast modules float. Once constructed, each module will be 13 feet in diameter and 10 to 12 feet in length. A typical, fully assembled hull unit – which includes four center modules and two end caps – will weigh approximately 227,000 pounds.

"Since they are made from concrete, they have to be of sufficient size so they displace more water than they actually weigh," Martinez said. "The distribution of the precast concrete within the construction of the hull itself is what allows it to remain upright."

Concrete's mass solved the STATIM's controlled buoyancy issue while enabling it to protect occupants from life-threatening tsunami waves.

"If it were made of steel, the force of the acceleration in the initial wave could shake the occupants to the point of injury or even death," Serrano said. "Concrete has a lot of positive factors."

NO MARGIN FOR ERROR

The main difference between the STATIM shelter and the concrete sewer pipe which inspired Serrano's design is that the STATIM is engineered with internal ring beams for added structural reinforcement. Modules are joined by watertight gaskets.

"With the current design, we can join up to five modules, plus two end caps," Serrano said.

The more rounded end cap will be positioned toward the

expected direction of the wave. The other end cap functions as a watertight door that enables ground-level boarding for passengers with disabilities.

In 2012, Serrano approached Toronto, Ontario-based Hamilton Kent to help design a robust, watertight joint and produce a gasket for the project.

"To accommodate the required pressure of 5 psi and the type of overlap on the sections, we had to come up with a unique solution," said Jason Maristanez, product development manager with Hamilton Kent. "Lives will be depending on the watertight seal."

Hamilton Kent typically manufactures gaskets for square precast structures and round concrete pipes, so they were well prepared to provide appropriate assistance. The company ended up modifying an O-ring joint to work with the STATIM's cylindrical shape.

"We provided a certain amount of gap in between the spigot and the bell of the joint," Maristanez said. "From there, we were able to calculate the proper diameter of O-ring to meet the pressure requirements Miguel required."

SIMPLE AND EFFICIENT

Serrano's production model is to create the steel forms and ship them to precasters that will produce the modules and transport them to installation sites. He plans to build a global network of precasters he can train and rely on for this part of the job.



Image courtesy of Brahman Industries

Since the project is still in the development stage, the precast specifications remain fluid. But one thing's for sure: The STATIM units won't be manufactured using any complicated mixes or compounds.

"Keep it simple is our goal," Serrano said. "We want the design to be easily duplicated in remote locations like Indonesia that may not have access to the same materials at the same cost as we have here."

Current specifications call for:

- Minimum concrete unconfined strength of 5,000 psi at 28 days
- Concrete specific weight equal to 150 pcf (a conservative assumption that may be reduced to 110 pcf)
- One-inch diameter, high-strength threaded bars
- Mild reinforcement to meet ASTM A615 Grade 60
- 0.6-inch diameter strand, Low-Relaxation to meet ASTM A416 Grade 270 ksi

Completed modules can be transported via standard low-bed trailers, railways or barges. STATIMs can be surface-mounted, partially buried or, if being used as a storm/tornado shelter, completely buried.

Installation is a breeze. First the site is prepped. Then the modules are joined and the gasket joints sealed. Finally, the elements are secured via post-tensioning. This enhances the flexibility and movement of the structures, allowing bigger shelters to be created.

MOVING FORWARD

Collaborative projects – especially when those involved are volunteering their time and resources – don't often move quickly. It took two years to develop the STATIM concept. In 2011, a month after Serrano received his first U.S. patent, a tsunami killed 18,000 people in Japan, precipitating the meltdown of the Fukushima Daiichi nuclear plant.

"It was painful to watch while we were working on something that really could have made a difference," Serrano said.

Because forms of this size are so expensive to make, Brahman Industries will initially use small-scale computer models to study the STATIM behavior, buoyancy and recovery times. Serrano anticipates producing a full-scale prototype later this year.

"We are striving to keep the cost around \$2,000 per occupant," Serrano said. "That would make it exponentially more costeffective than other alternatives."

At \$2,000 per occupant, he estimates the STATIM system will cost 1/10 the price of a traditional search and rescue operation. Additionally, STATIM is an improvement over alternative solutions because the units will be able to accommodate more people.

"Our idea is to spread shelters for 50 people throughout the region, so everyone is ensured they can reach their designated shelter," he said.

Serrano has already received a letter of interest from Japan for 250 units and strong interest from the Netherlands and Chile. Resorts, hotels and coastal communities are also inquiring about STATIMS.

"Miguel is a very capable and resourceful inventor and entrepreneur," Pararas-Carayannis said. "I'm confident it will come to fruition."

The success of STATIMs, Martinez noted, will also do much to promote the use of precast to deliver safe, easily constructed vessels to places without well-developed infrastructure systems.

"That would be extraordinarily significant," he said. PS

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



Racing to the Finish Line

Precast concrete plays a **crucial role** in the **early completion** of the massive Ohio River Bridges project.

By Bridget McCrea



Precast concrete played a major role in the early completion of the Ohio River Bridges project.

Macario Bernal stood on a new section of Interstate 65 in Louisville, Ky., taking in a sight that he'd been waiting 3 1/2 years to experience in person. Remembering a time when clogged bridges and interchanges made travel in the area a frustrating experience for motorists, Bernal almost couldn't believe his eyes. One of the region's most complex and expansive roadway infrastructure projects had been completed ahead of schedule and was ready to make life easier for commuters.

OPEN TO THE PUBLIC

"It was 10 o'clock in the morning on a weekday, and I noticed that two of the new lanes were already open and in use," said Bernal, quality control manager for Walsh Construction Co. of Chicago. "Just looking at the traffic flow, I could already see that things were moving relatively smoothly."

Looking to the north, Bernal then fixed his vision on four additional lanes that weren't even in use yet, realizing that the best was yet to come.

"That's what really put into perspective just how huge this project was," said Bernal, whose firm served as the general contractor for the Kentucky Transportation Cabinet initiative, a bi-state (with Indiana), \$1 billion endeavor known as the Ohio River Bridges project. "At the time, it was pretty awesome to think that, in several months, all of these new lanes would be open and operational."

The vision hit close to home for Bernal, who has resided in Louisville since the project kicked off in 2013. The result is a new, six-lane Lincoln Bridge, an updated Kennedy Bridge, and a new East End Crossing, which improves interstate connections in Indiana and Kentucky. Reading through Reddit threads about the initiative, he said it was "amazing to see how people were talking about the lanes opening up and how happy they were about it."

Bernal is happy too. He recently took the East End Crossing on a trip to Chicago and said the bypass reduced his commute by nearly 30 minutes.

"It's amazing how quickly you can get through the city now and how easily everything flows," he said.

Equally as amazing is the amount of time it took to improve the Ohio River crossing – an initiative that's been on the wish list of both Kentucky and Indiana for decades.

"Some of the people here have been waiting 40-plus years for this to happen," Bernal said.

Those individuals got their wish on Nov. 18 when the Downtown Crossing officially opened. The solution is comprised



The new bridges improve interstate connections in the region while shortening commute times.

of the new Abraham Lincoln Bridge (which carries six lanes of northbound I-65 traffic) and the refurbished Kennedy Bridge (six lanes of southbound traffic).

AHEAD OF SCHEDULE, WITHIN BUDGET

The project, which hit "substantial completion" in November, was finished a month ahead of schedule. With a lot of work to do within a short time frame, Bernal said the team of contractors, engineers and precasters pushed through and got everything opened up early.

"That was our intent the entire time," Bernal said. "The workers out in the field did a great job of helping us meet that goal."

Precast concrete played a key role in hitting the early completion date. Working on their respective parts of the project, A&T Concrete Supply Inc., County Materials Corp., Foster Supply, Gate Precast, Oldcastle Precast, Prestress Services Industries, S&S Precast Inc. and Sherman-Dixie Concrete Industries Inc. (now Forterra), all contributed to the project's rapidity.

Combined, these manufacturers produced many precast pieces for the project, including 40 acres of mechanically stabilized earth panels; 17 miles of beams; thousands of square feet of deck panels; box culverts and inlets; and reinforced concrete pipe and manholes. According to Bernal, one of the biggest advantages of using precast is that the material requires fewer connections during the prefabrication process.

"The biggest time-saver with precast is that everything comes to the [job site] preset and ready to go," he said. "Without as many connections to make, the amount of labor required to install the pieces is reduced significantly."

He added that inspection time is also minimized with precast, which presents less potential for errors. This, along with the speed of erection, helped ensure the project moved along at a rapid pace.

HALLELUJAH!

Thinking back on the 3 1/2 years that Walsh Construction worked on the Ohio River Bridges project, Bernal said the undertaking – while monumental in scope – went smoothly considering all of the different designs, components and entities involved. He added that the result is nothing less than spectacular, both in terms of its functionality and how it's been received by motorists.

State and city leaders share Bernal's enthusiasm for the project, which was not only completed ahead of schedule, but also within budget. "On behalf of every driver who has been stuck in Spaghetti Junction or who inadvertently found themselves in Indiana," said Kentucky's Lt. Gov. Jenean Hampton in a local news report, "hallelujah!"¹

In the same report, Kentucky Transportation Cabinet Project Manager Andy Barber said, "We've made it easier and safer to cross the Ohio River. We have set the stage for economic growth, better lives and a stronger community." **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.

Endnotes

¹ wave3.com/story/33748399/major-work-on-ohio-river-bridges-project-complete





Precast concrete products **prove integral** to **fast-tracked construction** of new facility at Royal Caribbean headquarters.

INNOVATION

By Mason Nichols

TT



STABIL Concrete Products worked closely with LEO A DALY in the design and production of all precast components.

From drones to augmented reality and beyond, advancements in technology allow professionals in the architecture, engineering and construction fields to tackle projects with enhanced efficiency and offer exciting new ways to approach their work. Such is the case for global cruise company Royal Caribbean.

Technology is at the heart of the company's new "Innovation Lab," a LEED Silver certified facility that will be an extension of Royal Caribbean's headquarters in Miami, Fla. The space will house a massive virtual reality simulator inside where employees can collaborate on ship designs. As workers walk into the space, they can view and test full-scale mockups of cruise ship features, including staterooms, suites and more.

Because the facility will be packed with impressive technology, building it with an equally impressive building material was a must. The logical choice for all parties involved was precast concrete.

IF YOU DESIGN-BUILD IT ...

In early 2016, Royal Caribbean partnered with Turner Construction to begin initial work on the Innovation Lab. Officials with the cruise company wanted the facility operational by January 2017, which meant the team had less than a year to progress from design to finalized construction. The team agreed that a design-build approach would offer the most realistic chance at meeting the project deadline, as it would allow all parties involved to stay closely connected throughout the process.

With little time to spare, Turner Construction needed an architect that it could rely on to move quickly. The company turned to LEO A DALY, a firm it had partnered with in the past. According to Rafael Sixto, AIA, LEED AP, managing principal with LEO A DALY, the short project timeline – coupled with the difficulty of obtaining building permits in south Florida – meant only one building material made sense for the job.

"One of the things that led us to select precast concrete was





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the speed of erection," he said. "The site was also very tight, so there was no place to stage the panels. It was all scheduled in a quick, sequential manner so that as trucks arrived with the precast panels, they were erected."

Brett Leven, project executive with Turner Construction, agreed, explaining that the design-build approach – when combined with the use of precast – played a major role in moving things along.

"We were designing the entire project together, which allowed us to speed things up," he said. "While we were going through the permit process, we already had drawings for the precast and the steel, so we got those submitted early to have the product on site."

A PRECAST PARTNER

Project precaster STABIL Concrete Products manufactured the 20-foot-tall architectural panels for the Innovation Lab. Each of the panels weighs anywhere from 10,000 to 27,000 pounds and contains a special white cement. The panels also feature a sandblasted exterior finish. Many of them are curvilinear, which creates a unique twist to the building that's reminiscent of ocean waves.

STABIL was also involved in the design-build process, which ensured that all the precast designs supplied by LEO A DALY and the rest of the team were feasible. STABIL's expertise offered particular value when it came to one component of the Innovation Lab, a "brow" piece that was designed to cantilever from the roof.

"With such mammoth pieces as these would be, the cantilever was too large to extend out that far," said Del Hight, STABIL president. "So we designed the panels by making them hollow on the inside to reduce weight and then extending them back over the top of the roof to offset the cantilever."

With the design-build approach, issues like this could be resolved quickly, allowing the work to proceed at a rapid pace. According to Sixto, without the close collaboration between



Workers installed the precast products for the Royal Caribbean Innovation Center in less than two weeks.

parties, the project could have taken up to two years to complete.

STABIL manufactured a variety of other precast products for the Innovation Lab, including stairs and landings. Workers installed the project's precast components in less than two weeks.

SEA THE DIFFERENCE

Royal Caribbean's original corporate headquarters facility was built with durable precast concrete, but lacked aesthetic appeal. As a result, the architects from LEO A DALY looked to develop a design for the Innovation Lab that would help add flavor to the original building. Royal Caribbean officials agreed and hope the structure will inspire the type of creativity they want workers to exhibit inside the Innovation Lab.

Ron Wiendl, AIA, director of design with LEO A DALY, explained that the solution was to add curvature to the design. The result is a building that differentiates itself from the existing architecture while still blending seamlessly with the original structure.

"From a designer's standpoint, I wouldn't have used anything but precast," Wiendl said. "I love the consistency that you get out of it, especially when you start working with organic shapes. That's where it really pays dividends."

Wiendl added that because the project is located in a saltwater

environment, precast panels were the ideal solution.

"At one time, there was talk about using metal panels," he said. "Metal panels in a salty environment? We just didn't feel really comfortable with that.

"Precast panels are so much nicer than metal panels could ever have been."

Hight echoed Wiendl, focusing on precast's durability.

"In this environment, the life cycle of precast makes it the premier product that they could have used," he said. "A lot of the look could have been accomplished closely in some portions of the building by going with block or stucco, but the life cycle of those materials doesn't compare with what precast will give them."

THE RIGHT APPROACH

When construction windows are tight, developing an effective design approach and selecting optimal building materials are paramount to success. By working closely together, the Innovation Lab's design-build team was able to meet the project's tight timeline through the use of precast concrete products. As a result, Royal Caribbean employees will be able to collaborate closely in the design of major new cruise liners – using advanced technological systems – for years to come. **PS**

Mason Nichols is the managing editor of Precast Solutions magazine and is NPCA's external communication and marketing manager.



Peculiar Prec

Atypical precast concrete products are the highlight of **unique p**

By Mark Crawford



ojects in the U.S. and Canada.



E&C Precast Concrete manufactured life-size farm animals for a local park using self-consolidating concrete.

Precast concrete is a vital building material that serves infrastructure needs across projects of all types and sizes. Many of these projects entail straightforward applications using standard components, but some require a creative, artistic flair. These projects often serve as a welcome change as they allow architects, engineers and owners to showcase their creativity while working in tandem with precasters. Three projects that reflect the creative use of precast are presented below.

LIFE-SIZE FARM ANIMALS

In 2011, city officials in Thornton, Colo., contacted E&C Precast Concrete to manufacture several low-maintenance, life-size farm animals for a historic local park. After several discussions, the city decided on a draft horse and a pig for Lee Lateral Trail Park and Playground.

Because the project was for a public park frequented by children, the city wanted the animals to be smooth and climbable. Officials also wanted the animals to maintain temperature control. Precast was the perfect material.

According to Kerry McGuire, owner of E&C Precast, precast was selected for its durability, versatility and low maintenance.

E&C Precast realized that the original, 5,000-psi mix design was not as smooth as it had hoped – even after polishing – so Project Manager Chris Wolfe changed the mix design to selfconsolidating concrete.

It was a challenging project from the beginning. Wolfe began by trying to find a standard file for making the animals. When that was unsuccessful, he found some small plastic models of a draft horse and traditional farm pig and used them for the final product design. Testing the stability of the first prototype of the horse led to some design modifications, including making the horse's stance wider and straighter. Wolfe also reinforced the steel frames of the forms.

"Initially, we had decided to pour these animals in two halves, casting on their sides and attaching them on site," McGuire said. "This would have provided great control for the pour and made them easier to transport. But the customer wanted a heavy, solid and smooth product, so we changed the forming to one solid piece standing straight up, so we did not have to flip them."

This did, however, make it more difficult to cast the animals and transport them to the job site.

"In most cases, we prefer to use lifting eyes or lifting devices



Armtec's LED-enhanced sound barriers were installed at a rail station and bus maintenance facility.

placed appropriately for all products that get this heavy, but for this one we used straps," McGuire added. "It was definitely a challenging project, but also a lot of fun to do. The animals are a big hit at the park, and we feel fortunate that we could contribute to that."

LET THERE BE LED LIGHT

Armtec, a precast manufacturer headquartered in Concord, Ontario, undertook several municipal projects that involved integrating LED lights with precast concrete for sound barriers. In Hamilton, Ontario, a sound barrier located within a new rail station not only reduces traffic noise created from cars entering and leaving the station, but also provides a secure privacy wall for adjacent residents. In Ottawa, Ontario, the sound barrier surrounds a city bus maintenance facility.

After studying different noise control methods for the Hamilton rail station, the design team selected a double-sided, sound absorptive noise wall. A blend of standard precast concrete panels and Armtec's Durisol panels compose the noise barrier.

"Durisol precast panels are sound-absorptive composite panels made of a proprietary material consisting of neutralized and mineralized wood shavings mixed and bonded under pressure with portland cement," said Courtney Goodbrand, technical sales marketer for Armtec.

The panels were installed between galvanized steel flanges and stacked in a tongue-and-groove pattern. LED lights embedded into the barrier create an attractive display across the panels from top to bottom.

Armtec used the same process and materials to build the sound barrier around the perimeter of the bus facility in Ottawa. Not only is the LED lighting aesthetically pleasing, it's also functional: the moving display of colored lights across the panels represents various bus routes. Different colors represent the routes and the intensity of the LED pulses indicates the frequency of buses on individual routes.

The biggest challenge was manufacturing the panels to incorporate LED box fixtures, conduits and junction boxes. Custom light boxes were fabricated and placed within panel molds. The LED light fixtures were installed and wired on site by electrical contractors. Electrical conduit placed within the panel molds ran vertically from each LED fixture and from the top of the panel to the bottom. Accurate placement was critical for the





Central Washington University's new observation tower was built with 120-degree-arc precast concrete pieces.

conduits, which needed to be in the same location on every panel to enable panel-to-panel connections on site.

The tongue-and-groove stacking of the panels, when combined with the LED lighting, results in an attractive basket-weave pattern that creates a sense of movement.

"This is a custom pattern that we helped design with the architect on the Ottawa bus garage project," Goodbrand said. "With the popularity of this unique look, it has become one of our standard patterns for our noise barrier panels."

WATCHING THE STARS

Building an observation tower is not an everyday task – especially when it's made from precast concrete.

Wilbert Precast of Spokane, Wash., partnered with Central

Washington University in Ellensburg to provide the precast concrete for an observation tower that's part of the university's new science building. The tower stands 85 feet tall with an outside diameter of 21 feet. Wilbert Precast teamed up with Structure Engineering to determine how to meet very specific design characteristics. The tower could only sway up to 1/16 of an inch in a 100-mph wind due to a telescope and dome that would be installed on top of the structure.

The project began in the spring of 2015 and finished by early summer. The tower consists of 120-degree-arc precast pieces. Each piece is 2 feet thick, with three pieces making up one level. The pieces include post-tensioned grout tubes and a custom wood grain board and batten formliner in a vertical pattern.

The tower started with a 5-foot, 6-inch tall level with an erection access blockout, which when anchored to the cast-inplace leveling pad created the foundation. Seven full-height levels were manufactured and installed on the foundation.

"All segments had to line up perfectly for the post-tension rods and grout keyways to function," said Brandy Rinkel, quality assurance and process controls manager for Wilbert Precast. "We ordered a custom metal form as soon as the customer approved the final shape and finish. Without the custom form from Helser Industries, the difficult shape would not have been possible to manufacture."

Wilbert Precast used an on-site batch plant to mix SCC, which was crucial for the project considering the detail in the formliner and the large amounts of reinforcing required.

"Introducing a formliner with a 3/4-inch deep reveal and then expecting to slide the outside jacket up and out from the product definitely made [the project] more challenging," Rinkel said. "Also, due to the curvature of the form and product, coupled with the texture of the formliner, we had to devise a padded push bolt system to remove the product from the form. A custom wood jig was also fabricated to aid in the tying of double-layered reinforcing cages."

Capped with a metal dome and a 24-inch-diameter mirror, the observation tower is now a campus highlight. It accommodates up to 25 astronomy students and other stargazers who watch the night skies for planets, stars and celestial events.

DOING IT ALL

Precast concrete will always serve as a reliable, long-lasting option for infrastructure projects around the globe. But it's also the ideal building material for custom work made possible by the creativity and innovation of architects, engineers and owners. **PS**

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

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Specifier Q&A

This month, Precast Solutions magazine sits down with Tom Burkhart of GHD to discuss his involvement with precast concrete products and projects.



Some of the hydroelectric conveyance projects Burkhart works on involve the use of helicopters for delivering precast concrete products.

Name: Tom Burkhart

Title: Senior Project Manager

Company: GHD

Professional Designations: P.E., Model Law Structural Engineer, Post Disaster Safety Evaluator

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

A: I am a structural engineer engaged in detailed design and multidiscipline project management. I have designed dozens of on-site precast building projects. Since the 1990s, I have also designed various hydroelectric conveyance and control projects under Federal Energy Regulatory Commission jurisdiction, including utility and bridge projects using off-site precast concrete components.

Our office specializes in construction projects at remote sites. We determine how to construct facilities during short construction windows in late fall and early winter at altitudes of up to 13,000 feet above sea level. In some cases, our designs involve using helicopters to deliver construction materials and equipment.

I have extensive design and construction experience in all modern construction materials, but my more recent focus has been on projects constructed of concrete and steel.

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

A: We have found precast concrete affords several advantages over cast-inplace concrete or other building materials when working around streams with the



U.S. Army Corps of Engineers, the U.S. Forest Service and the U.S. Fish and Wildlife Service.

We've designed bridges using precast concrete elements which were dropped in place on supporting abutments while avoiding stream bed disturbance. Precast concrete construction provides significant additional benefits on mountain agency water conveyance projects where utilities providing water for consumption or revenue through hydroelectric generation have short outage periods in the late fall and early winter. We have also perfected water conveyance system replacement by using precast. In the past, this process relied on wood flume construction. Precast concrete has proven to be more durable than wood, and is resistant to forest fires, landslides and rockfall. Consequentially, it's more economical over the long term.

Precast construction also offers the opportunity for significantly increased quality control on critical infrastructure projects. By precasting flume sections, construction can begin sooner and precast sections can be staged for the start of the facility's outage. Where possible, precast sections are placed on cast-in-place foundations on top of an engineered earth "bench" or on an elevated steel structure by conventional construction equipment. However, because many sites are not accessible by conventional equipment, we engineer the sections and handling methods using high-strength, lightweight concrete so that they can be lifted and placed by helicopter.

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

A: In California, designing dependable water conveyance systems is very rewarding. For example, El Dorado County is dependent on a conveyance that originated shortly after the gold rush era. The county receives about 1/3 of its drinking water from this system. To have an opportunity to engineer a long-lasting, durable replacement for the aged and antiquated systems of the past is incredibly satisfying. In collaboration with clients, our structural, geotechnical, civil and land survey experts provide communities with best-value solutions.

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

A: Over the course of my career, I have seen precast concrete evolve in various ways, including its use in building façades and structural systems, MSE wall veneers, bridges, and, of course, water conveyance and drainage structures. When I began my career, I had no idea that I would be designing projects using precast elements. Today, I definitely see the benefits of precast concrete in construction, including scheduling and cost benefits, the ability to meet compressed construction schedules and the improved quality control inherent to construction in a controlled environment.

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