Veneers–Tradition Meets High Performance

Embedding, or veneering, stone, brick, and other natural materials into precast concrete panels speeds construction while providing efficiency, reducing costs, and improving thermal performance

— Craig A. Shutt

Precast concrete offers aesthetic versatility and efficiency by replicating a range of masonry and natural-stone appearances. But for some projects, authentic materials are required. Embedded or veneered precast concrete allows for all the beauty of these natural materials, but with the added quality, speed, durability, reduced maintenance, and cost savings associated with precast. Since precast is manufactured offsite, it also reduces negative effects at the project site such as staging and storage requirements, scaffolding for installation, and protection from inclement weather—plus it requires fewer trades.

"The aesthetic choice always comes down to the client's priorities, preferences and budget," says Marsha Hoffman, principal at SFS Architecture in Kansas City, Mo. "There sometimes are unique requests that can only be met by using the materials that precast concrete might otherwise replicate."

That's especially true for buildings' bases, where owners sometimes want authentic stone materials at eye level. Higher up, precast concrete's capabilities to reproduce those colors and textures often make it a more cost-effective choice.

The following projects show some of the ways that stone, tile and other natural materials have been embedded, or veneered, to precast concrete.

Federal Courthouse

The U.S. General Services Administration had specific concepts and concerns when it commissioned the design and construction of the Christopher S. Bond U.S. Courthouse in Jefferson City, Mo. "Budget and constructability were the key factors in how the project was designed," says SFS's Hoffman. "But aesthetically, they wanted limestone and granite used to project the image they sought."

The courthouse was sited adjacent to historic buildings on an abandoned state penitentiary site. It sits back from one of the oldest remaining buildings, with an outdoor plaza providing public gathering space between the two structures. Administrators wanted the new courthouse to blend with those buildings while projecting a durable, institutional appearance. "The new courthouse needed to reflect the civic dignity and importance of the building's judicial function, while meeting the goal of a 100-year building," says Hoffman. To achieve this, they used precast concrete panels with a limestone and granite veneer on their face.

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Designers initially considered a CMU backup with installed limestone. "That would have created a very labor-intensive and expensive approach," says Hoffman. "When we looked at using precast panels, we found that it would be considerably faster and more economical while meeting the aesthetic needs and constructability requirements. Once we explained the concept to the client and they understood the advantages, they readily agreed to the approach. It worked out best for all factors."

The conceptual design centered on placing the building on the corner of the site, with the entrance opening onto a large courtyard/park stretching across the other three corners. The courthouse sits on a bluff above the river. The structure features a concave design, with both ends curving out toward visitors as they approach through the plaza. A trellised cornice with a light and airy appearance rings the top of the building.

A special suction-cup vacuum system was created for use in the production facility to pick up the stone veneer and set each piece into the forms to avoid damage. The limestone pieces varied in thickness from 3 to 6½ inches, with some as large as 8 by 10 feet, and weighing as much as 1,400 pounds apiece. The thin stone was veneered to the precast panels, which were as large as 10 by 40 feet

The Christopher S. Bond U.S. Courthouse in Jefferson City, Mo., features architectural precast concrete panels embedded with limestone veneers. The building's concave shape creates a strong entry space across a large courtyard. The structure is embellished with a precast concrete trellised cornice across the building's top, which is lit at night with strategic placed fixtures. The project achieved a LEED Gold rating. Photos courtesy of Aaron Dougherty Photography.

PROJECT SPOTLIGHT

Christopher S. Bond U.S. Courthouse

Location: Jefferson City, Mo.

Project Type: Government building

Size: 118,000 square feet

Cost: $67.7 million

Design Architect: Kallmann McKinnell & Wood Architects, Boston, Mass.

Associate Architect: SFS Architecture, Kansas City, Mo.

Owner: General Services Administration, Washington, D.C.

Structural Engineer: Walter P. Moore & Associates, Kansas City, Mo.

Contractor: J.E. Dunn Construction, Kansas City, Mo.

PCI-Certified Precaster: Enterprise Precast Concrete Inc., Omaha, Neb.

Precast Speciality Engineer: Rupprecht Engineering, Omaha, Neb.

Precast Components: 381 components with thin-set granite and limestone, including wall panels, cladding, columns, and cornices

in overall size, using stainless steel anchoring pins. These allowed for differential movement of the concrete and stone veneers.

Particularly challenging were the curved pieces along the building's front façade and trellised cornice. Lettering for building identification was also precisely cast into the panels to look as engraved letters.

Additional detailing was used to direct water flow off the cornice and other areas to ensure water would not infiltrate into the building. Lighting also was embedded into the upper areas to highlight the trellis and cast shadows onto it at night. "There were significant complications in the detailing on the project, but its constructability remained the foremost goal to ensure fast construction on the budget we had," Hoffman says.

LEED Gold Certification

Another key goal was to incorporate sustainable-design features, which allowed the project to achieve LEED Gold certification. The precast concrete panels contributed in a variety of ways. These included providing regional materials and manufacturing, lowering construction-site waste by consolidating trades, aiding energy efficiency through its high thermal mass, and using recycled materials in the panels' composition. The building's orientation on the site also played a role, as it helps emphasize daylighting and reduce lighting needs.

Speed, aesthetics, and economy were the key reasons designers chose precast concrete panels embedded with manganese ironspot thin brick for the façade of Lucas Oil Stadium in Indianapolis, home to the NFL's Colts. The total-precast concrete structural system helped ensure the project could be built on a tight 36-month schedule and open for the new season on time. Photos courtesy of HKS Inc.

PROJECT SPOTLIGHT

Lucas Oil Stadium

Location: Indianapolis, Ind.

Project Type: Football/basketball indoor arena

Size: 1.847 million square feet

Cost: $720 million

Designer: HKS Inc., Dallas

Owner: Indiana Stadium and Convention Building Authority, Indianapolis

Structural Engineer: Walter P. Moore, Houston

Contractor: Hunt Construction Group, Indianapolis

PCI-Certified Precaster (architectural components): Gate Precast Co., Ashland City, Tenn., and High Concrete Group LLC, Springboro, Ohio

PCI-Certified Precaster (structural components): Coreslab Structures Inc., Indianapolis

Precast Components: 1,548 architectural pieces, including thermally efficient insulated wall panels, and 3,637 structural pieces, including slabs, stairs, risers (single, double, and triple), tubs, load-bearing panels, and vomitory walls

The overall project was a great success facilitated by combining prefabricated materials into a panelized system. "Combined materials could go up into place immediately, and once those panels were in place, we basically had an enclosed project," she says. It also significantly simplified the construction and saved money. The project came in $3.5 million under budget.

Hoffman notes that SFS has used precast concrete on other projects to achieve similar looks without veneer cladding, using precast's capability to replicate the look of limestone. "That's often a viable alternative, but it depends on the client's goals," she says. "This project was very well executed and has been well received in the community and by the client. Everyone is very pleased with the results."

Lucas Oil Stadium

Stadiums represent another large, high impact type of building that often has to project a strong appearance using stone or other high-end materials. For Lucas Oil Stadium in Indianapolis, home to the National Football League's Colts, speed of construction and long-term durability were just as important as the structure's aesthetics. That meant using a rain-barrier system rather than a traditional rainscreen. Many consider rain barrier systems easier to install and maintain. Because they have no cavity to collect moisture, they usually reduce the potential for mold and other long-term moisture-related issues.

The stadium seats 73,000 and converts sightlines from football to NCAA's basketball tournaments. It also contains 150,000 square feet of convention floor area. The stadium was oriented to align with the original radial street pattern designed for the city, and the brick facade was intended to tie the facility to the historic brick buildings in the downtown area's garment district. It also provides a sympathetic nod to Indiana's original basketball fieldhouses.

The schedule was tight because the owners needed the stadium ready for the beginning of the 2008 football season in August. Erection of the precast began in September 2006 and took 18 months in all. That schedule included the erection of 1,548 precast architectural pieces, including the insulated sandwich wall panels embedded with thin brick, along with 3,637 structural components, such as stairs, risers, and load-bearing panels. "The 36-month overall construction schedule was tight for a stadium with a large, retractable roof in the Midwest," says project designer John Hutchings, principal at HKS Inc. in Dallas. "Precast concrete panels embedded with thin brick afforded the construction team the comfort that the exterior skin would not be any cause for construction delays on the project. This approach allowed critical finishes to meet the proposed completion date."

The seven-level facility used a total-precast concrete structural design to provide speed, aesthetics, and economy, Hutchings says. The embedded manganese ironspot jumbo thin brick compliments the traditional hand-laid brick used on other buildings in the downtown area.

The arched entrances into the stadium used thin brick that was corbelled to enhance its visual expression. The brick mortar lines, which are actually 6000+ psi precast concrete, tapered from ¼ to ⅜ inch from one side to the other to create the arched appearance. The panels adjacent to the arched entrances incorporated limestone detailing within the precast to add a decorative touch. Several mockups were created of the panels with careful detailing of the brick coursing to indicate how they would appear on the façade.

The large vertical pre-insulated column covers were sequentially poured, allowing them to be erected as one large piece versus three pieces. This reduction meant fewer pieces needed to be transported and erected, while also reducing the number of sealant joints to maintain and providing a more energy-efficient envelope. The precaster paid special attention to detailing and locating seams from sequential casts in the least visible locations. A unique gravity connection was used to support the arched soffit added on the east and west main entrances.

At more than 200 feet to the top of the building, it would have proven time-consuming to hand lay masonry and construct a back-up system, Hutchings notes. By contrast, the brick panels were lifted into place with a crane in a fraction of the time. The insulated panels consisted of a 3-inch exterior wythe with embedded thin brick, 2 inches of continuous insulation and a 3-inch interior wythe that served as a structural wall. The precast walls thus provided the exterior brick envelope, insulation, vapor and air barriers, and paintable interior surface in one piece, which accelerated the schedule, reduced trades and risk, and saved material and money.

"The energy-efficient precast concrete insulated wall panels with thin jumbo bricks created a detailed and elegant exterior façade," says Hutchings.

Target Field

Another Midwestern stadium took a different approach to its veneer exterior, incorporating large, dramatic, rock-faced limestone onto precast concrete panels. The owners of Target Field in Minneapolis felt so strongly about the use of the stone that they added its cost into their budget, says Bruce Miller, principal at Populous, the architectural firm for the project. "The owners felt so passionate about using this local stone that they willingly paid the overage from the state's fixed contribution to ensure it could be used."

The stadium serves as the home to Major League Baseball's Minnesota Twins and sits on one of the league's smallest sites. The stadium's aesthetic design was created to reflect its position in nature and the outdoors, Miller notes. But the site proved challenging, as it offered immediate access to light rail and commuter rail in an urban environment, meaning it was surrounded by immovable obstacles.

The stadium's construction progressed on a fast-track basis to ensure it was ready for the beginning of the 2010 season in April. "The legislation authorizing construction allowed for a best-value selection process,"

Target Field in Minneapolis features a veneer of scraped-earth limestone on its precast concrete panels, which create a distinctive, rugged appearance. The precaster provided a design assist on the stadium, the home to Major League Baseball's Minnesota Twins, to help complete the project on a fast-track basis. The panels helped contribute to the building's LEED Silver rating.
Photos: Christy Radecic, Bob Perzel, Paul Crosby, Gage Brothers Concrete Products

PROJECT SPOTLIGHT

Target Field

Location: Minneapolis, Minn.

Project Type: Baseball stadium

Size: 980,000 square feet

Cost: $544 million

Designer: Populous, Kansas City, Mo.

Owner: Minnesota Ballpark Authority, Minneapolis

Contractor: Mortenson Construction, Minneapolis

PCI-Certified Precaster (architectural components): Gage Brothers Concrete Products, Sioux Falls, S.Dak.

PCI-Certified Precaster (structural components): Hanson Structural Precast, Maple Grove, Minn.

Precast Components: 1779 pieces, including limestone-clad wall panels, thin-brick clad wall panels, acid-etched components, risers, slabs, tubs, stairs, and vomitory walls

explains Miller. That meant the construction manager could work with the precaster to figure out details prior to having the design package for the entire facility completed.

"The precaster worked hand-in-glove with us on a design-assist basis as the project progressed, so we were finishing design drawings as they were finishing shop drawings," Miller says. Having the contractor and precaster on board during the design process was helpful, he adds. "They could ensure the panels were going to align and would create an efficient panelization."

Scraped-Earth Veneers Used

"Our goal was to create the look of a limestone outcropping along the Mississippi River valley but keep it fairly smooth in appearance," Miller says. The aesthetic design focused on large, stacked blocks of rough-faced limestone native to the area.

This "scraped-earth" facing consists of the top strata in the quarry that in earlier times was thrown out to allow the smoother underlying face to be used. These were thin pieces, 2½ to 4½ inches in depth, that were honed and cast into the precast concrete wall system.

"These pieces created challenges for the precaster to manufacture, as they had to cast pieces of limestone with non-uniform surfaces that varied in thickness by 2 inches within one piece," he explains. The pieces could not project outward by that much variation, he notes, as it might create handholds that visitors might use to try to climb the façade.

The limestone pieces, which varied in width from 3 feet 9 inches to 5 feet, were cast face down in the form, with ¾-inch joints between them. Stainless-steel ties anchor the blocks to the front of the precast panel, and a 6-mil bond breaker was used to prevent concrete from entering the joints. It also accommodated thermal expansion of the dissimilar materials.

"We could not accept a wall system that had the appearance of panelization," he says. Mockups were created that were two bays wide and several panels high to see the large-scale appearance in advance.

The design also called for gradations in the stone color from darker hues at the base to lighter at the top, to visually "ground" the structure and reduce its scale. The stone was graded into eight colors and tones and the shop tickets for the panels were sent to the stone supplier for detailing with the color selection and instructions for cutting the stone to the proper size. Smooth accent bands run through the façade, which were designated in the shop drawings. A pattern in the design was created,(to speed the design), but it repeats so seldom that it is imperceptible, notes Miller.

"There was nothing square, straight, or plumb about the 88-foot-tall wall system," he says. Many walls were battered a variety of different degrees, while each corner intersected at a different angle. A number of canted walls and articulations added to the depth and unusual shapes. "Ballparks by their nature aren't square, and this one maintained that design. These different interfaces provided some real challenging geometry, but precast gave us the versatility to meet them."

Because of the tight site, the façade was erected from within the footprint of the stadium and then reached across to complete it as the shell was completed. "It was a blind pick on the backside of the building because there was no outside access," he says. "It was a logistical feat."

The project also received LEED Silver certification, only the second MLB stadium to achieve that designation. The overall cost to achieve this certification was estimated to be less than 0.5% of the ballpark's $545-million budget.

The precast concrete components contributed to a variety of the points achieved. These included 30% of all installed materials made from recycled content, 60% of the building's exterior offering regionally sourced materials, and an 80% reduction in the amount of extracted clay used. Miller says "The stone-faced precast concrete wall panels definitely played into our LEED strategy."

The result is a dramatic appearance that saved time and money while achieving sustainable-design goals. "The precaster did a superb job coordinating the design, fabrication, and installation of the limestone-clad wall system." The company joined the design process two years prior to construction to assist with the project.

The project has been well received, he notes. "We really like the stone face this approach provided," Miller says. "You can see skeletons of ancient creatures in the stone if you look closely. It creates a unique look for a baseball stadium." They are not alone in their admiration of the facility. In 2010, ESPN voted the venue as the best "sports experience" in the country.

Mercy Health – West Hospital

Some veneers can't be replicated with precast concrete textures or formliners. That was the case with the dramatic exterior for the 250-bed Mercy Health – West Hospital in Cincinnati, Ohio. This facility included precast concrete insulated sandwich wall panels embedded with 167,000 8-inch-square glazed bricks in 19 shapes and 11 colors, varying from light green to dark blue.

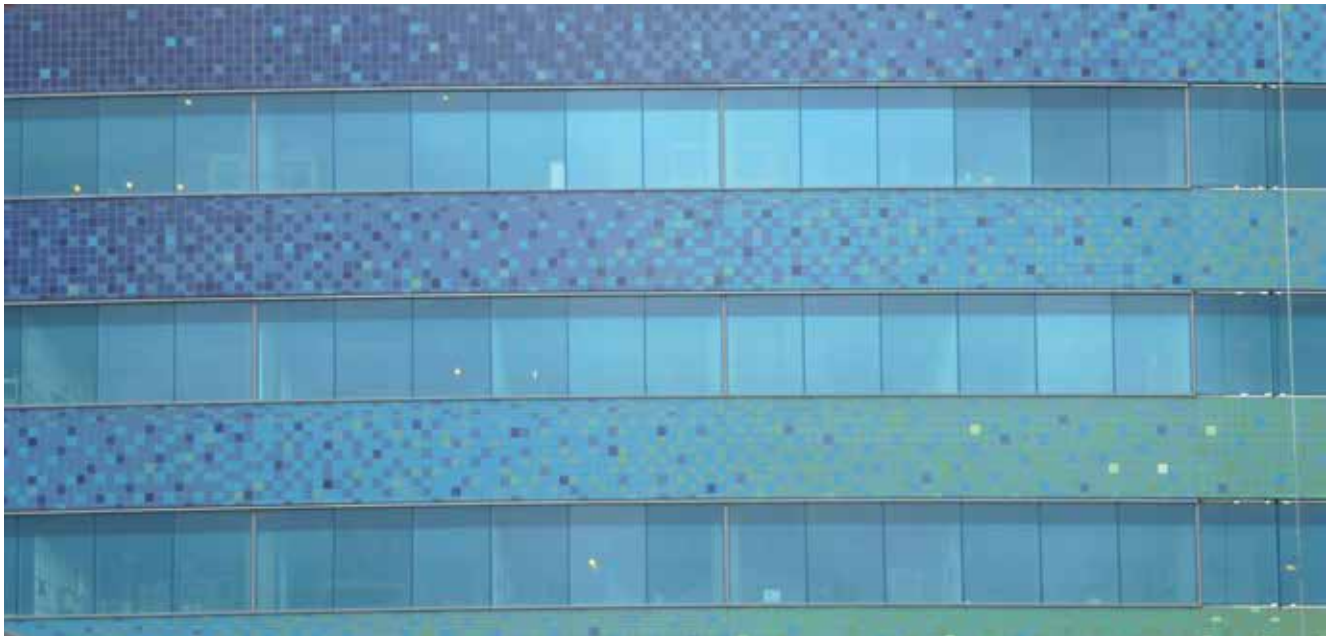
"The building design provides a strong visual statement that gives the new hospital a unique presence in its community," says Mic Johnson, design principal with architectural firm AECOM in Minneapolis. The inspiration came from the history of the area, which served as home for a number of the world's best ceramics companies during the first half of the 20th century.

The building features a long, low two-story base consisting of diagnostic and treatment facilities, flanked by two towers of patient bedrooms. The roof of this base is covered with native plant materials, making a 100,000-square-foot green roof. Building support services, including mechanical, loading/material management, and staff parking, were located below the grade of the entry, hiding them from view.

"We used the local history as a starting point for our concept, as we looked at how the building sat on the site and related to the hills and valleys of the area," Johnson explains. "The strong connection between architecture and landscape, including the green roof, will enhance the healing environment." To complement that feeling, the building was designed to emphasize visual transparency, offering continuity from the entry atrium through the hospital with easy wayfinding systems and visual connections.

This sense of welcome and transparency begins with the calming, vibrant exterior that blends the greens of the landscape with the blues of the sky. Johnson spent nine hours at the glazing plant selecting the exact colors desired. Once the colors were chosen, the manufacturer created samples, and the precast producer produced mockup panels demonstrating the architect's vision.

Composition was critical, as the firing had to retain uniformity and consistency in the bricks to ensure they



Some 167,000 8-inch-square glazed bricks in 19 shapes and 11 colors, varying from light green to dark blue, were embedded in the precast concrete panels used to clad the Mercy Health – West Hospital in Cincinnati, Ohio. The building features two towers of beds with a 100,000-square-foot base with diagnostic and treatment facilities with a roof of native plant materials. Photos courtesy of Select Thin Brick.

PROJECT SPOTLIGHT

Mercy Health – West Hospital

Location: Cincinnati, Ohio

Project Type: Healthcare facility

Size: 645,000 square feet

Cost: $173 million

Architect of Record: Champlin Architecture, Cincinnati

Conceptual and Healthcare Designer: AECOM, Minneapolis

Owner: Mercy Health, Cincinnati

Structural Engineer: THP Limited, Inc., Cincinnati

Contractor: Turner Construction Company, Cincinnati

PCI-Certified Precaster: High Concrete Group LLC, Springboro, Ohio

Precast Components: Architectural panels embedded with 167,000 glazed bricks

could be embedded into the precast concrete formliners without any discrepancies. "Our goal was to work with the precaster to ensure the manufacturing process was controlled and that we didn't have to use cut tiles, while avoiding a panelized appearance," Johnson says.

The designer used acrylic paints to color a scale model of the project and then scanned and translated that model into digital breakdowns for the drawings. Autodesk's Revit software design program was used to model the tiles and lay out the variety to provide the gradation sequencing that was desired. Each color was given a name and number, and these were applied across the façade.

The numbers then were printed onto the tiles by the thin-brick supplier and onto the shop drawings, so the precaster could follow the layout to place the proper tiles into the forms by color number. The numbering was critical, as the backs of the tiles were all the same color. Once the brick was face down in the form, the production crew could not check the color positions, so they checked the numbers on the bricks' backside to the shop drawings.

One Pallet Per Panel

Each pallet contained the precise number of thin bricks in the required colors for each panel's production. This allowed the plant to place a pallet of tiles on the casting bed that contained the exact quantity, size and color of thin bricks needed for each precast concrete component. The result was significant labor hours saved compared to pulling the appropriate bricks from all the color and size choices.

The designers considered other choices, he notes, including rainscreen options with a variety of larger

tile sizes up to 16 inches. "We found that the 8-inch tiles gave us the look we wanted, and on the rainscreen designs, the price became too expensive to install. Precast concrete gave us an economical approach and was the most durable option as well. We wanted to look at a service life of up to 100 years for this building."

The precaster noted that it was critical to use a thin-brick body that met the PCI standard for size tolerance, offered a thickness greater than ½ inch to create an acceptable bond, and to include a dovetail backing that provided a mechanical bond to the precast concrete. The most important characteristic of the glazed thin brick was its low water-absorption quality. This characteristic prevented water from being trapped in the brick and causing long term performance issues.

The panels average about 35 by 7 feet, with an interior 4-inch wythe of concrete, a 2-inch layer of insulation, and an exterior 3-inch concrete wythe. The result is a dramatic appearance that also provides energy efficiency while offering a unique and welcoming design. "The architecture will continually provide a new experience to building users, changing with the quality of light, the time of the day, and the seasons," says, architect Johnson.

Logan-CONRAC Parking

The new ConRAC (Consolidated Rental Car Facility) at Logan International Airport in Boston features a unique façade consisting of terra cotta veneer panels embedded in structural precast concrete walls. The design provides a dramatic and complementary appearance, but it posed challenges as the first use of terra cotta on structural panels in North America and one of the few in the world.

"Given that it had never been done before, the owners and everyone on the construction team had to ask if the benefits of using it in this way were worth the risks." explains Camille Bechara, project manager and lead designer with Parsons Brinckeroff, the architectural and engineering firm on the project. "We worked through everything carefully and found that they were."

The project is designed to handle approximately 5000 vehicles and consists of a four-level, 1.2-million square-foot precast parking garage to consolidate rental car facilities. It also includes an 111,000 square feet Customer Service Center (CSC) building, as well as maintenance and storage areas for rental car operations, often referred to as Quick Turnaround Areas (QTAs). The project will consolidate the existing car rental shuttle buses into a shared common bus system, and will feature a reconfigured taxi pool, roadway and intersection improvements, site access improvements, landscaping, and new pedestrian and bicycle facilities.

Initially, designers intended to use inset thin brick on precast concrete structural panels as the dominant material because it complemented local buildings. Officials at Massport, the owners, liked the concept but wanted a more contemporary design overall to provide a balance between the old historic neighboring houses and the modernized airport, and the use of terra cotta came to mind as being the appropriate material, Bechara says. The garage façade architect, Fennick & McCredie, developed the terra cotta option, and a manufacturer with quarries near Florence, Italy, was selected to provide the material. "The terra cotta provided the warmth and color of brick but also the modern look as it could be used in larger pieces and different sizes that appealed more than the smaller, standard brick sizes," he explains.

The original concept was to construct precast concrete walls for the structural needs and then provide a metal frame to serve as a rainscreen, with the terra cotta panels set into that. As they worked with the precaster, however, the team realized that embedding the terra cotta into the precast panels, as more typically was done with thin bricks, could save a substantial amount of money—about $1 million.

"We focused our efforts on constructability to minimize the risk for everyone," says Bechara. The panels were cast 51 feet tall, 12 feet wide, and 10½ inches thick, with 2- by 3-foot, ¾-inch-thick terra cotta pieces set into the panels. Haunches also had to be cast into the panels' reverse sides to support three levels of double tees for the four-story building.

Prototype Test System

Prior to approving the system, a variety of prototypes and mockups were created and tested. "We had to identify the issues and test the impact of everything: humidity, elasticity, movement between materials, maintenance needs, and others," Bechara says. "We wanted to see what the chances were for cracking and how easily panels could be repaired or replaced if needed."

Small sample panels were created to guide color selection and jointing, followed by the creation of full-size prototypes. These life-size mockups were even driven around the plant on bumpy roads to simulate worst-case delivery conditions. Some were deliberately cracked to see how easily they could be repaired. The panels passed all of the tests. "The panels worked very well," he says. "Their response to the tests really made this approach attractive to the owners."

Risk on the project was spread through each function, he notes. The terra cotta supplier agreed to assume responsibility for the terra cotta delivery and for its 30-year warranty once it was erected. The precaster took responsibility for the panel safety during casting, transportation, and erection, to ensure no handling, deflection, or other erection issues arose outside the control of the terra cotta manufacturer.

Embedding the terra cotta into structural components was one of the critical factors to the design because the nine rental-car companies that will operate the structure wanted complete flexibility in laying out their spaces and directing customers through their tenant area, he explains. That required a wide-open expanse with lateral load resisting elements moved to the perimeter to eliminate interior shearwalls or bracing. Precast concrete's structural versatility was the perfect solution. The structure features 60- by 60-foot

The new Consolidated Rental Car Facility at Logan International Airport in Boston is the first project in North America to feature structural precast concrete panels faced with terra cotta veneer. Structural panels were used to shift loads to the parking structure's perimeter, allowing open access for the eight rental-car companies to layout their individual spaces efficiently. Photos courtesy of Parsons Brinckerhoff.

PROJECT SPOTLIGHT

CONRAC Parking Structure

Location: Logan International Airport, Boston

Project Type: Parking structure and support facilities

Size: 1.2 million square feet garage

Cost: $236 million

Designer/Structural Engineer: Parsons Brinckerhoff, Boston

Garage Façade Architect: Fennick McCredie Architecture, Boston

Customer Service Center Architect: PGAL

Owner: Massport, Boston

Contractor: Suffolk Construction, Boston

PCI-Certified Precaster: Blakeslee Prestress Inc., Branford, Conn.

Precast Components: 2,215 double tees, girders, columns, seismic H- and moment frames, wall columns, spandrels, stairs, solid slabs, and wall panels

bays consisting of precast concrete columns and double tees. H-frames were used to support loads along the perimeter, with interior moment frames provided between columns and girders.

"We liked the flexibility that the precast concrete framing system provides to give each rental car company complete flexibility in designing its layout," he says. "Each has exclusive rights to lay out its space and direct cars as they want because there are no columns to impede them." The terra cotta material also provides a noise buffer that helps prevent noise from reverberating through the area, Bechara notes.

The structure also was designed to achieve LEED Silver certification. Precast concrete aided this goal through its use of local materials and manufacturing, recycled materials, minimal construction waste, and other features.

The project is scheduled to open later this summer and has been receiving acclaim from the owners, car companies and rental customers. "It provides the masonry look that complements the residential buildings while also creating a contemporary appearance that suits the airport facilities," Bechara says. "Everyone on the team took some risks to ensure this could be done, but they proved to be well worth it. Embedding the terra cotta veneer offered significant savings, and we made it work."

For more information on these or other projects, visit www.pci.org/ascent.