

Mixed-Use Projects Creating Flexibility, Challenges

Precast concrete structural and architectural systems help meet a variety of needs as owners look to expand functionality and revenue-generating options

— Craig A. Shutt

Multi-use projects offer owners a variety of benefits, including revenue-generating functions, more pedestrian traffic and more activities for users. But fitting those different capabilities into one structure and balancing all the functions—while also meeting aesthetic criteria—creates challenges. Precast concrete components often can help achieve the myriad of goals.

These projects often blend offices,

residences, retail, parking, entertainment, other functions, or all of them. Each has its own building code requirements and marketing strategies. These programmatic and legal needs can create challenges in interfacing functions and materials that can be difficult to meet. In addition, each may have its own desired image and designing an architectural statement that fits them all requires balance and artistry.

The following projects show ways in which precast concrete architectural and structural systems can help achieve the proper balance among all of the functions in a multi-use project and help to make it a successful project.

Medical Office Building

The Medical Midtown Office Building on the St. David's Medical Center campus in Austin, Texas, was designed to enhance the strengths



The Medical Midtown Office Building on the St. David's Medical Center campus in Austin, Texas, features doctors' offices and parking designed with a total-precast concrete structural solution. Precast was used to minimize maintenance and allow for rapid shell construction, which was accomplished despite the tight site.



PROJECT SPOTLIGHT

Medical Midtown Office Building

Location: Austin, Tex.

Project Type: Mixed-use (medical offices and parking)

Size: 358,000 square feet (82,000 square feet of office)

Cost: \$23.5 million

Designer: GSC Architects, Austin, Tex.

Owner: HealthCare Facilities Development Corp., Austin, Tex.

Contractor: Pepper-Lawson Construction Co., Austin, Tex.

PCI-Certified Precaster: Coreslab Structures (Texas) Inc., Austin, Tex.

Precast Specialty Engineer: Consulting Structural Engineering Services Inc., San Antonio, Tex.

Precast Components: Columns and beams, double tees, ramps and shear walls, stair risers, load-bearing architectural panels, and spandrels.

All photos in this article are courtesy of Genster



and character of the surrounding facilities while adding space for doctors and parking for the building and campus. The new 358,000-square-foot project features five levels of above-grade parking and one below-grade level for 630 cars total and three stories (82,000 square feet) of offices beginning at the top level of the parking structure. In addition, a lecture hall and flexible classrooms were provided on the first office floor. A precast concrete roof covers the office area of 28,000 square feet, while a 2,836-square-foot mechanical deck covers the parking area. "The owners wanted the parking levels to be constructed with precast concrete to reduce maintenance concerns and budget over their lifetime," explains Buddy Goodson, project manager for Pepper Lawson Construction. "Looking at the overall building scenario, it made sense to build the entire project with precast concrete. It allowed for quick construction on a very constrained site and gave us the flexibility and aesthetics that the owners wanted."

The project features precast columns and beams, several depths of double tees, ramps and shear walls, stair risers, load-bearing architectural panels, and spandrels. The panels cladding the office floors were cast with embedded thin brick to match the style of the surrounding buildings. Coreslab Structures (Texas) provided the precast concrete components.

In addition to adjacent buildings continuing in operation during construction, the site was backed up to a major freeway with high-voltage power lines running overhead. That eliminated the capability to use a tower crane and restricted site maneuverability, adding challenges. At the same time, using embedded thin brick eliminated the need for eight stories of scaffolding on the tight site, Goodson notes.

"Having the brick in place on the skin when the panels arrived allowed us to put in the glass as soon as the panels were in place and allowed us to close in the building very quickly," he says.

The first floor office features 17' 8" floor-to-floor heights to accommodate the 160-seat auditorium and classrooms. The classrooms were designed as two large spaces with movable partitions to accommodate smaller teaching areas as needed. The upper office

floors had a 14' 8" floor-to-floor height for flexibility of tenant spaces.

Precast Provided Clear Spans

"Following the bay sizing for the parking structure below allowed for the clear spans needed for these special uses," notes Ray Moreno, Project Manager for GSC Architects. The double tees for the office levels were 34 inches deep, according to Rick Penhorn, project engineer at Consulting Structural Engineers, the precast concrete specialty engineer on the project. The parking structure used 28-inch-deep double tees, while both 28- and 34-inch-deep double tees were used for the roof members.

The architectural precast concrete spandrels provide load-bearing elements to support the floors around the building's perimeter. Additionally, 10- and 12-inch-thick architectural precast concrete walls were used at stairs and elevators to provide the lateral stiffness to resist wind forces.

Special care was taken to find a brick mix that would resemble the existing color and style, notes Moreno. "The brick for the other buildings was a modular product that could not be used with the new building," he explains. Instead, the designers worked with the precaster to find a manufacturer who could create a three-brick blend of thin-brick to match the four-brick mix used in the brick modules on the existing buildings. The parking structure levels feature a standard architectural finish.

Special care was taken to find a brick mix that would resemble the existing style.

During erection, a crawler crane was positioned inside the structure's footprint, with trucks backed up to the site for picking and immediate erection of delivered panels. Detailed logistical planning was needed to position the crane and create truck routes to maneuver the deliveries to the proper location on the site to ensure easy loading and no disruptions to operations on the campus.

Retaining walls around the below-grade levels were created with cast-in-place concrete, after which the

total-precast concrete structural system was erected. The building was erected up to the fourth floor on one end and then the crane was moved to the opposite end to erect that portion. That opened the other end for other trades. Ultimately, floors were being topped on one end as panel erection continued at the other.

Special care was taken during casting to ensure exact alignment of the brick runs between panels, made more complicated by the variety of facets and joints needed to align them in three dimensions. The largest panels, some 63 feet long, required close attention during stripping and handling. An added challenge came in creating a cut-stone limestone appearance for exterior stairways, which required creating an intricately detailed formwork pattern.

Parking Levels Open Early

The fast erection time for the precast concrete paid off in bringing the building online quickly, Goodson notes. The parking levels were in operation before the office levels were completed, alleviating congestion even as construction continued.

A structural-steel bell tower was added as a final aesthetic touch, which complicated construction. It was fabricated on the ground inside the garage footprint while erection was underway and then lifted into place atop the precast concrete elevator tower. Timing was critical, as both structures were completed simultaneously and had to be completed before the crane had to move to its next position. Tolerances were precise, but the tower was lifted into place and welded to the precast concrete components while a cheering crowd and local press watched.

Greenway Self Park

Creating parking space in Chicago's high-end River North neighborhood provided a critical need, but constructing a 12-story building in a congested downtown area created challenges that were met in part with a precast concrete structural system. The 288,900-square-foot Greenway Self Park project emphasizes its sustainable initiatives while providing 715 public parking spaces and 14,415 square feet of retail space on the first floor.

The precast concrete system, comprising columns and beams, shear



PROJECT SPOTLIGHT

Greenway Self Park

Location: Chicago, Ill.

Project Type: Mixed use (parking and retail)

Size: 288,900 square feet (14,415 square feet of retail)

Cost: \$15 million

Designer: Cubellis, Chicago, Ill.

Parking Engineer: Walker Engineering, Elgin, Ill.

Owner: Friedman Properties, Chicago, Ill.

Contractor: Bovis Lend Lease, Chicago, Ill.

PCI-Certified Structural Precaster: ATMI Precast, Aurora, Ill.

PCI-Certified Architectural Precaster: Lombard Architectural Precast, Alsip, Ill.

Precast Specialty Engineer: Precast Engineering Company, Waukesha, Wis.

Precast Components: Shear walls, double tees, columns, beams, spandrels, wall panels, stair units, and architectural wall panels.

The Greenway Self Park in Chicago's upscale River North neighborhood features a distinctive appearance for its combination of retail and parking space. The total-precast concrete structural solution blended with translucent, green-tinted glass patterned with five designs and long structural tubes running the height of the building. The precast aided construction on the tight site and also helped the building achieve a LEED Silver rating.

During the final phases, trucks were routed under the building structure.

walls, double tees, stair units, and architectural spandrels, was chosen due to its economy and capabilities for meeting a tight schedule, according to David Ryan, director of operations for Walker Engineering in Elgin, Illinois. "The project was a high-end design with a high-end finish for this neighborhood, and it had to deal with a number of challenges, including a tight site."

The structural precast concrete components were provided by ATMI Precast in Aurora, Illinois, while the architectural spandrel panels were fabricated by Lombard Architectural

Precast in Alsip, Illinois. HOK and DM Design Group served as the architects on the project, while Bovis Lend Lease was the general contractor.

The site was surrounded by other tightly-packed buildings, with a small lot owned by the developer located adjacent to the site that alleviated congestion and provided a staging area for construction materials. The structure essentially was built as four towers, positioning the crane to build each corner and then connect them, one floor at a time, walking the crane off the site and into the adjacent lot to complete the erection of the precast

concrete components.

A "haul road" was created for the crane and delivery vehicles, which entered from the southwest corner and exited to the northeast. During the final phases, trucks were routed under the building structure. A small crane located on the roof installed the façade system, which consists of steel columns, beams and glass. The columns were welded to the metal embeds in the precast concrete panels, the beams were bolted to the columns and the channel glass was installed between each beam using a receiver clip.

The first floor contains retail spaces, with a higher floor-to-floor clearance than upper parking levels to provide elevated merchandising space for retailers. Above this level, a special weatherproof traffic coating was applied to the double tees, which feature a 2-inch-thicker flange to ensure weathertightness between the open parking levels above and the retail stores on the first floor.

Double Helix Ramp Used

A speed ramp was created to move vehicles quickly past the retail level to the parking levels above, with a double-helix ramp provided to raise cars two floors for every 360-degree circle they complete. Crossovers were provided on several levels to allow access to intervening floors without having to drive to the top and return.

The erection proceeded quickly within the confines of the congested downtown space. A key aesthetic element was added with etched channel glass serving as the main façade, supported by the precast concrete spandrels, with embeds cast into the panels to accept the glass connections. The translucent, green-tinted glass was formed into a 10-inch-wide C-shaped vertical plank supported at the top and bottom by an aluminum structural tube.

Five patterns of glass were created by varying spacing and orientation of the channels. The spacing between the glass units allows air to flow through while shielding views into the garage. The glass is accented with channel-glass inserts at each corner. Glass caps on each corner serve as contemporary cornices.

The retail spaces on the first floor feature energy-efficient glass with a black-granite base. The storefronts are accented with alternating columns clad in precast concrete and red granite with stainless-steel tubes for highlights.

The project features a number of sustainable-design concepts that helped the project achieve a LEED Silver rating. These include 12 helical wind turbines on the roof that generate electricity and parking spaces on the upper levels for electric and hybrid cars. The precast concrete also contributed to the rating via its energy efficiency, recycled and locally-manufactured materials, and other factors.

A swimming pool with landscaped gardens will be added on the roof for

guests at the adjacent hotel, and double tees on this level were thickened by 20% to provide the necessary support. Spandrel panels facing the hotel on this level were designed to be replaced so a bridge to the hotel could be created at a later date without undue complications in construction.

Lobbies on each level feature tips for sustainable-design concepts that help encourage users to create a greener environment. These tips reinforce the message delivered by the project that functional and attractive designs can also offer sustainable living concepts.

'The owners' goals were to create a durable, high-quality structure that could withstand the beach environment and salt air.'

The Metropolitan

The Metropolitan project in Jacksonville Beach, Florida, was the first large-scale, mixed-use building allowed along the beach, and it has served as a pioneer for additional construction. The project includes retail space on the first floor, parking for 320 cars on floors two through five, 30 office condominiums on levels six and seven, and 26 residential condominiums on levels eight and nine. The multiple functions and beach location required a lengthy design and permitting process before it could proceed.

Helping to speed construction once the nine-story building was approved was a total-precast concrete structure. It features columns, beams and double tees with load-bearing architectural panels for its façade. Gate Precast Co. in Monroeville, Alabama, supplied the architectural precast panels, while the plant in Jacksonville, Florida, supplied the structural precast concrete components.

The project was "cutting edge for condos in this area, especially with the materials we used as well as being mixed-use in a high-rise application," Tom Rensing, principal at KBJ Architects told local newspapers. The owner wanted to develop the property with multiple uses and asked the

designer and contractor Elkins Constructors to create a plan that could bring that vision to life. Initially, the building featured a cast-in-place design, but that was value-engineered to precast concrete to speed the construction schedule.

"The owners' goals were to create a durable, high-quality structure that could withstand the beach environment and salt air," Rensing explains. "I've done a lot of precast concrete parking structures, and we saw that we could extend those concepts to work well with these other functions. I like working with concrete. It provided all the benefits we sought as well as some additional ones."

Precast Creates Open Spans

A key advantage came with the 60-foot-wide spans that the double tees could provide. "Each function in the building has different layout requirements, and it can be difficult to stack them. Parking requires long, open spans, while other functions require more walls that add loading. Precast concrete provided the clear spans we needed on those levels while providing support for upper floors. The condominium levels also benefited from being able to be designed with fewer columns. That eased the complexity of the design."

The retail levels were designed as speculative spaces, and they since have been filled, including a restaurant on the corner. "The precast concrete design provided a lot of flexibility in creating the retail spaces, which ensured they were attractive to a wide range of retailers," Rensing says. The precast concrete also provided inherent fire resistance, which saved time and materials and simplified the requirements for meeting building codes for the various functions and separations between them.

Plant-casting the components also provided another benefit, he noted. "The quality control in the plant ensured that we did not have to worry about steel reinforcement ending up too close to the surface. With some projects, that has led to corrosion and spalling due to the salt air penetrating and reaching the steel. That doesn't happen with precast concrete."

Fabricating the components off-site also alleviated congestion on the site, which was constrained on all sides. Contractors had only 2 feet of leeway to the north and south and 20 feet on



The first large-scale, mixed-use building on the beachfront in Jacksonville Beach, Florida, The Metropolitan features retail space, parking, offices, and condominiums. The project features a total-precast concrete structural solution enhanced with architectural panels that used a blend of local aggregates to create a terra-cotta color that didn't require paint or stucco to blend with nearby buildings.



PROJECT SPOTLIGHT

The Metropolitan

Location: Jacksonville Beach, Fla.

Project Type: Mixed use (retail, office, condominium, parking)

Size: 258,000 square feet

Designer: KBJ Architects Inc., Jacksonville, Fla.

Owner: Metro Beach Developers, Ponte Vedra Beach, Fla.

Contractor: Elkins Construction Inc., Jacksonville, Fla.

PCI-Certified Structural Precaster: Gate Precast Co., Jacksonville, Fla.

PCI-Certified Architectural Precaster: Gate Precast Co., Monroeville, Ala.

Precast Specialty Engineer: Seaboard Services of Va., Richmond, Va.

Precast Components: Columns, beams, double tees, and load-bearing architectural panels.

the east and west sides. "The delivery of materials and erection had to be tightly choreographed, but it went smoothly," Rensing says.

The aesthetic treatment of the panels required them to be large and heavy compared to typical architectural members. The construction team remained in close communication throughout the erection to ensure the beam and column members, which were integrally cast into the load-bearing members, could be handled at the site.

The precast concrete mix used for the façade features a blend of local aggregates, including Florida limestone, high-quality fine white sand and pigments that achieved a peachy, terra-cotta color that didn't require paint or stucco to blend with nearby buildings, Rensing notes. A light sandblast was provided on the panels with an accent achieved with a slightly heavier sandblast. The condominium levels feature exposed ceilings for a semi-loft look and high-performance windows to enhance aesthetics and help maintain the building's energy efficiency.

"This is the only building that's constructed like this in the state," says Austin Calhoun, assistant project manager for Elkins. Rensing agrees.

"It's an elegant building with a lot of versatility."

Hampton Roads Transit Facility

The Bus Maintenance facility for the Hampton Roads Transit company in Norfolk, Virginia, featured a number of significant challenges for developer Concord Eastridge and the construction team led by A/E firm Parsons Brinckerhoff. The facility needed to contain bus parking and maintenance centers as well as office space and employee parking. A tight site and a variety of aesthetic needs, coupled with a fast construction schedule, made precast concrete components the best choice for some of the components.

The complex consists of a three-story, 60,000-square-foot office

building featuring a total-precast concrete structural system and a 138,000-square-foot precast concrete parking structure for 320 cars with bus-maintenance operations on the lower level. Two additional buildings were constructed with steel frames and architectural precast concrete panels for cladding. They consist of an 80,000-square-foot administrative-support and bus-parking structure and a 9,000-square-foot wash/refueling facility.

"The precast concrete designs were chosen because of the speed of construction they provided, as well as their ease of maintenance and ability to create a high-quality finish at a

relatively inexpensive cost," explains Brian Eichenlaub, a supervising architect with Parsons Brinckerhoff and the final project manager.

Aesthetics was a key driver, he notes. The back sides of the buildings, facing into the complex, were finished with precast concrete panels given a medium or light sandblast, creating a banding pattern, with the addition of reveals to break the scale of the massive structures. The more public sides of the buildings feature thin-set brick embedded into the façades, providing a traditional look that adds detail and texture. Tindall Corp.'s Virginia Division in Petersburg, Virginia, supplied the precast concrete components.

'Using a total-precast system made construction simpler and eliminated some of the trades from the site.'



The Bus Maintenance facility for the Hampton Roads Transit company in Norfolk, Virginia, consists of office, bus-maintenance facilities, refueling and washing space, and office space. The office and parking facilities feature total-precast concrete structural solutions, while the others feature architectural precast concrete panels, most of which include embedded thin brick to provide a masonry façade appearance.



PROJECT SPOTLIGHT

Hampton Roads Transit Facility

Location: Norfolk, Va.

Project Type: Bus-maintenance and storage facility with offices and employee parking

Size: 287,000 square feet

Cost: \$62 million

Designer/Engineer: Parsons Brinckerhoff, Norfolk, Va.

Owner: Concord Eastridge Inc., Arlington, Va.

Contractor: W.M. Jordan, Richmond, Va.

PCI-Certified Precaster: Tindall Corp.'s Virginia Division, Petersburg, Va.

Precast Concrete Specialty Engineer: TRC Worldwide Engineering Inc., Allentown, Pa.

Precast Components: Beams, columns, double tees, inverted-L beams, insulated architectural concrete panels, load-bearing panels, and stairs.



The precast concrete parking structure features columns, beams, double tees, inverted L beams, and stairs to complete the package. It connects to the adjoining section of administrative building via a pedestrian ramp consisting of flat slabs at the upper level.

The bus-maintenance portion of the administrative building features wide bay openings that provide access and maneuverability for the buses as they arrive at the depot. Long skylights were installed in this portion of the complex to provide daylight to the building's center. This required the pre-caster to cast openings into the roof tees and frame around them. A green roof was created over some portions of the structure, which helped the project achieve LEED certification.

The lateral system for the buildings posed a challenge for connecting the beams and columns, as the structure used moment-frame connections to resist lateral forces. As the foundations were designed as pinned and not fixed, this created exceptionally high forces to transfer between the beams and columns. The resulting beam-to-column connections required large welds to secure them to the columns. Similarly, the beams were not prestressed, as the pre-caster didn't want any shrinkage to the columns from the prestressing to occur once the connections were made.

The total-precast concrete office building features columns, beams, double tees, and architectural panels. "Using a total-precast system made construction simpler and eliminated some of the trades from the site that would have been required during the construction of the shell," says Eichenlaub.

The design also provided open interiors by using long double tees, some of which reached 72 feet long. "We were able to provide a lot of open space for the floor plans," Eichenlaub says. "Steel framing would have required columns every 24 feet on-center." The precast structure also provided the necessary fire-separation between the bus-maintenance area and the Class-B office space. "It was very, very easy for us to achieve the fire-separation standard we needed using the precast concrete structure."

The site was tight, with the buildings near the edge line, fitting the large footprint onto a 9.7-acre triangular site. Power lines within 10 feet of the lot line also had to be watched carefully to ensure nothing disrupted

them. As a result, one of the buildings was notched so the other structure could be fitted up against it as construction continued.

The site also dropped 2½ feet from one end to the other, requiring taller columns on one side of the parking structure to level the floors. "We maxed out the slenderness ratio for the columns just within the tolerable limits for the column lengths to achieve the height we needed," Eichenlaub says.

The parking structure was completed first, followed by the bus-maintenance facility and the three-story office building last. The work moved smoothly, Eichenlaub says, thanks in part to the close cooperation among the construction team members.

"We approach a project with ideas that will achieve the owners' goals, but in working with the precast on this design, we created better and more efficient ways to provide the strong appearance while minimizing the number of pieces and making construction easier. We talked with Tindall throughout the design phase and worked through the details in the shop drawings to incorporate their ideas for how to make the work efficient."

These designs show a multitude of ways that different functions can be fit together to achieve a variety of needs in a condensed, efficient space. The versatility of precast concrete components ensured these designs will meet the owners' needs today and in the future.

'The total-precast concrete structure was used for both functional and financial reasons.'

St. Charles Plaza Building

An ambitious \$100-million project in St. Charles, Illinois, plans to revitalize a 7.2-acre portion of the downtown area by creating a riverfront pedestrian walkway, public plaza and a variety of building functions, including residential, office, commercial space and parking. A key building in the program, one of the first projects completed, contains two-story-tall restaurants and retail on the first level, offices and parking on the floor above plus two additional levels of parking.

The 160,000-square-foot Plaza Building features a total precast concrete structure, consisting of 1,050 components including columns, beams, double tees, spandrels, shear walls, load-bearing wall panels, and hollow-core planks. Spancrete fabricated all of the precast concrete components.

"The total-precast concrete structure was used for both functional and financial reasons," explains Ryan Gusewelle, senior project manager for Power Construction Company, the general contractor on the project. "We needed larger, open bays without columns for both the retail and parking levels, and precast concrete could provide those spans easily."

A cost analysis also was done, which determined that the most cost-effective way to achieve long spans would be to use precast concrete. The owners and designers also knew that costs would be higher if the construction had to extend into the cold winter months, when sitework would be more difficult and expensive to accomplish.

Precast concrete also aided the schedule by speeding erection of the building shell and by helping to create the aesthetically-pleasing design the owners needed to draw attention to the structure as the first signature design in the development. Precast also helps minimize long-term maintenance needs.

Blending Retail, Parking

Combining the retail and office functions with parking facilities required particular attention to moisture prevention between levels (the needed fire separation was inherent in the concrete's composition and required no additional applications). Because the double tees remained exposed on the ceiling side of the lower retail and office levels, they were insulated using fiberglass insulation with a foil vapor barrier. These materials were attached to the precast double-tees with stick pins adhered to the concrete. On the upper side, the pretopped double tees had a waterproofing membrane applied over them.

The exterior features embedded thin brick on architectural panels on the north, south and west walls, which face away from the high-profile street side. On the east facade, field-applied brick was installed onto structural precast concrete wall panels cast with dovetail slots and over gypsum wall structures. "The embedded thin-



An ambitious \$100-million project in St. Charles, Illinois, kicked off with the construction of the Plaza Building, which combines retail, restaurants, offices and parking. A total-precast concrete structural solution was used to provide the necessary structural support and open spans that all functions in the building desired. The project was designed so the parking levels could be opened ahead of the rest of the project to provide these services to the community quickly.



PROJECT SPOTLIGHT

Plaza Building

Location: St. Charles, Ill.

Project Type: Mixed use (retail, offices and parking)

Size: 160,000 square feet

Designer/Engineer: Knauer Inc., Deerfield, Ill.

Owner: 1st Street LLC, St. Charles, Ill.

Contractor: Power Construction, Schaumburg, Ill.

Structural Engineer: McCluskey Engineering Corp., Naperville, Ill.

PCI-Certified Precaster: Spancrete, Arlington Heights, Ill.

Precast Components: Beams, columns, double tees, load-bearing architectural panels, and stairs.

brick precast concrete panels were more cost-effective, but the field-applied brick on the streetside façade was used to match the nearby buildings in the historic downtown area," Gusewelle explains. The southeast corner features load-bearing, architecturally finished curved precast beams to highlight this most prominent corner and pull attention to the building.

A key challenge arose in building over Walnut Street, which runs beneath the building that otherwise covers the full city block. The street was shut down during construction and double tees were used to span the street, resting on load-bearing precast concrete walls on each side. Positioning the crane to build this portion required close communication and attention to logistics.

Speed was essential to bringing the

project online early so parking spaces could be used while other construction progressed. The building, with its retail and office levels plus 300 parking spaces, took 14 weeks to erect.

A cast-in-place helix ramp was installed at the back of the building to facilitate access to all five floors and ensure maximum spaces on each level inside the parking levels. The precaster had to work closely with the concrete subcontractor to ensure the interface between the ramp and the precast concrete components worked smoothly. Close tolerances were required to ensure quick construction.

The project is the first of a number planned for the development in the coming years, which will provide as much as 136,500 square feet of retail space, 115,000 square feet of office

space, residential apartments and condominiums, nearly 1,000 parking spaces, and a variety of public improvements. A number of these additional structures also are planned to feature structural precast concrete systems and architectural panels, in part owing to the benefits achieved on the first project to be completed.

This wide range of projects, incorporating a variety of functions, shows some of the ways that precast concrete structural and architectural systems are helping designers meet the needs of mixed-use buildings. As owners continue to diversify their properties to provide more capabilities to attract a wider variety of tenants and customers, the need for flexible solutions will continue to grow. ■

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