

Precast Concrete Creates High-Performance Homes

Whether designers are creating high-rise condominium complexes or single-family residences, precast concrete structural and architectural systems can meet challenges that arise

— Craig A. Shutt

Following the collapse of the housing market in 2008, families began evaluating their best residential options for the long term. That has led to a return to urban centers, as well as more interest in condominium and rental properties that offer amenities and less maintenance. To meet these needs while providing a striking appearance and structural benefits, designers are using precast concrete in a variety of ways.

Precast concrete's aesthetic versatility ensures that any residential property can fit into its neighborhood, whether it consists of historic homes or contemporary high-rises. It can match or create virtually any color, texture, or shape required while integrating with other materials. Its structural versatility provides for long open spans, flexible floor plates, and the ability to integrate the structural system with the envelope saving time and money, while creating more usable space.

Precast concrete's inherent efficiency allows for rapid construction and hence, earlier occupancy. Its thermal mass, ability to serve as a continuous air barrier, and option to incorporate continuous insulation provides a complete energy efficient envelope system that will help reduce long-term costs. Also, precast concrete's inherent resiliency provides multihazard protection and passive fire resistance.

The range of options can be seen in these projects, which cover a wide geographic and residential mix. The

benefits provided by precast concrete vary with the needs of the project, ensuring an economical, aesthetically pleasing, and easily constructed design.

The Century

At the high (literally) end of the market, curved architectural precast concrete panels were used to clad The Century, a 42-story residential tower in Los Angeles, Calif. The developers' goal was to "create a condominium complex that offered timeless West Coast elegance and contemporary green-living experience that redefined estate living," explains Daniel Lobitz, project manager at Robert A.M. Stern, the architectural firm on the project. The building is located on the former Twentieth Century-Fox Studios production lot along the Avenue of the Stars in Century City.

The goal with the building's appearance and layout was to create a "contemporary yet classic design that provides a modern-day approach to sustainable building and luxury high-rise urban living, which is rare amid the sprawling valleys and car culture of Los Angeles," he says.

The site was developed with a variety of "L.A. tropes," Lobitz says, that invoke the glamour of an exclusive hotel. These include sunken gardens, outdoor entertaining areas, and a pool with cabanas. High-end stone, such as marble, granite, and limestone, were used widely throughout the building, totaling more than 1,300 tons in all. Among the amenities are floor-to-ceiling windows, private elevators, wine storage, and a fitness center with

pool and spa. Each residence has a private elevator vestibule, fireplaces, and large balconies. A restaurant, conference room, catering kitchen, library, and screening room also are included.

Precast concrete was specified for the cladding on the design-build project because it could create the intricate details required, as well as serving as a backing for the travertine veneer while also replicating that look on upper floors. "The precast concrete used on The Century supported the design goals of the project to bring a high-quality finish to the building," Lobitz says. "It provided a durable and sustainable solution."

The panels feature a light-cream finish with reveals throughout that break up the panels' mass and convey the look of the stone motif throughout the façade. Due to the tower's elliptical shape, all but 82 of the 1,147 precast concrete panels were cast on convex or concave forms, creating challenges for achieving the high-quality appearance that was required while using difficult forming designs.

"The radiused shapes of the panels contributed to the function of the building, with the curved forms allowing for optimum natural lighting," Lobitz explains. "The diagonal siting of the radiused panels provides open vistas between neighboring towers to the south toward the ocean, to Beverly Hills to the west, and to the surrounding cityscape." The tower's detailing, with fluted columns, pilasters, and protruding eyebrow lintels, pays homage to the residential architecture in nearby Beverly Hills and Bel Air. "The quality



Architectural precast concrete panels clad The Century, a 42-story residential tower in Los Angeles, Calif. Designers wanted to project a contemporary yet classic appearance that combined modern touches with sustainable design.



Photos: Paul Turang

PROJECT SPOTLIGHT

The Century

Location: Los Angeles, Calif.

Project Type: Condominium complex

Size: 207,000 square feet

Designer: Robert A.M. Stern, New York, N.Y.

Owner: The Related Companies LP, Los Angeles, Calif.

Structural Engineer: Magnusson Klemencic & Associates, Seattle, Wash.

Contractor: Webcor Builders, Los Angeles, Calif.

PCI-Certified Precaster: Clark Pacific, Fontana, Calif.

Precast Components: 1,147 curved architectural panels, curved spandrel panels, and column covers.

and craftsmanship of the precast lent itself nicely to the overall elegance intended for the structure.”

The panels were cast in custom-made curved molds designed to create the proper shape for each piece. “There were many radii involved due to the building’s egg-shaped footprint,” says Sam Argentine, senior project manager with Clark Pacific, the pre-caster. Some of the panels even have two distinct curves in them to meet the unique geometry of the building’s curved ends. Many panels feature deep reveals and contain blockouts for punched windows and other details. In some cases, panels contained two large punched windows, creating thin members that had to be stripped carefully. “Stripping and handling the two-window pieces were very challenging,” says Argentine.

To provide support during transport and maneuvering the pieces into a vertical-lift position at the site, the pre-caster welded a number of strongbacks into the backside of the panels. These back-to-back channels provided support frames that secured the panels during delivery and allowed positioning as they were lifted from the trucks. The strongbacks were disconnected once the panel was secured to the crane hoist. There were approximately 12 different versions used to secure all of the different radiused panels.

Travertine granite was hand-set into the building’s base, but veneer pieces were set into the precast concrete panels on the north tower, where the granite continues up the building’s face. Details on the panels vary every five or six floors, creating a segmented look that helped reduce the building’s scale. Each section featured its own balcony style to further set it apart.

Typical panels were 11 by 25 feet, with balcony spandrel panels measuring 4 by 25 feet. Column covers of about 8 feet wide and 8 feet tall also were created. The panels were lifted from the delivery trucks and moved into position via a tower crane that could reach to the top of the 42-story building. Dentil spandrels with deep reveals were used to clad the balconies, providing depth and added finish to the façade.

The Century incorporates a variety of sustainable-design features, which allowed it to be awarded LEED Silver Certification by the U.S. Green Building Council. These features address energy efficiency, sustainable building

materials, water conservation, and indoor environment quality.

Precast concrete aided the LEED certification by being manufactured within 500 miles of the site and for using local materials in their manufacture, including recycled materials. The panels also reduced site congestion and construction waste and consist of material that can be recycled for other uses if the building is torn down.

“The project’s sheer size and scope was a great challenge on many fronts,” says Clark Pacific’s Argentine. “The incorporation of the Italian travertine as well as the elliptical shapes necessitated a significant investment of additional time to design and successfully produce the precast architectural panels.” Overall the aesthetic versatility of high-performance precast concrete met challenges head-on, and helped the designers meet and exceed the project’s goals.

Myers Place

On the other end of the scale, a total-precast concrete structural system provided the ideal solution for a four-story residential building designed for those with disabilities in Mount Prospect, Ill. The 32,000-square-foot facility features four finishes in the load-bearing wall panels used, including three colors of thin brick that were cast into the panels.

“The architecture of Myers Place uses a lively blend of cast stone and thin brick, a variety of brick colors, and details that emphasize the different interior uses of the building to create a ‘sense of place,’” says Therese Thompson, project manager at Cordogan, Clark & Associates, the architecture firm on the project. “The design intent is to reinforce the developer’s mission to provide access to high-quality affordable housing for people with mental or physical disabilities as they move towards recovery or self-sufficiency.”

The structural system used on Myers Place consists of columns, beams, wall panels, and hollow-core planks. The planks rest on wall panels and serve as both ceiling and flooring in one piece. This approach reduces the number of subcontractors and scheduling issues required by combining the structural and envelope systems to create the building’s shell.

“The general contractor was very familiar with the precast concrete structural system, often referred to as total precast, so they were comfort-

able with that approach,” says Thompson. Masonry alternatives were priced, she notes, “but we found that the precast concrete option was more economical than any other option.”

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The speed of construction also was a benefit, she adds. “The precast concrete structure was erected quickly, allowing us to get the shell enclosed rapidly and get the floors into place so we could start on interior work. It definitely helped expedite the construction process.”

Construction speed was enhanced by the designers taking advantage of precast concrete’s speed in casting repetitious panels one after another. “By using repetition in the panels, we kept the design very economical and also sped up fabrication of the pieces. But we still were able to achieve a variety of aesthetic appearances while maintaining that speed.”

To create visual interest, the exterior features modules with dark brown brick and punched windows that alternate with red and tan brick units. The bottom floor and accent frames around the windows have a buff-colored, sand-blasted appearance that replicates the look of limestone. End units feature projecting bays that add dimension to the rectangular, four-story building. These were created by projecting steel-framed sections out from the precast concrete and cladding them with fiber-cement siding to lessen the load.

“The architect understood the benefits of precast concrete and how to maximize its efficiencies,” says Auggy Chung, regional sales manager with Spancrete, the pre-caster. For instance, to eliminate the need for complicated thin-brick returns at corners, designers created vertical precast concrete bands that eliminate brick at the edges. The bands project out from the brick line, creating additional depth and visual interest.

The architect had created other pre-

cast concrete projects, but typically uses it for taller buildings, Thompson notes. "This is the lowest-rise building we've done with a total precast concrete system," she says. "We were surprised that precast was so competitive with other building systems for a four-story building. We found that it lent itself well to the mid-rise type, where we were able to exploit the repetition of producing many similar panels and columns. Repetition is a major help to minimizing the budget."

Designers provided standard accessible amenities, such as elevators and toilet rooms, for the project, funded in part by a grant from the Illinois Housing Development Authority. Four units are fully accessible and eight units can be easily adapted to be fully accessible. "It's designed to provide independent living, but it does have on-site social service caseworkers, which meant creating office space for those services," she explains. The building's first floor also features a laundry, community room, and computer room.

Erection of the panels moved smoothly, as the site's former use as a parking lot provided unobstructed space. The hollow-core panels, using the precaster's proprietary design, were 8 feet wide and 10 inches thick, allowing for faster erection than narrower profiles provide. Exterior panels were 9 inches thick and varying sizes, while interior demising walls to create corridors were 8 inches thick. A thermal break was provided between the planks and panels to create continuous insulation. In all, 95 exterior wall panels, 50 interior wall panels, and 193 pieces of hollow-core plank were installed in only 20 days.

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The hollow-core plank had a leveling topping applied to the top side to create even floors and had a textured paint sprayed onto the underside to create an acoustical ceiling. "Hollow-core inherently has high acoustical control due to the material's mass and the voids at the center, so we



Photos: Cordogan, Clark and Associates

The 32,000-square-foot Myers Place residential building in Mount Prospect, Ill., combines four finishes in its load-bearing precast concrete wall panels. The facility offers affordable housing for people with mental or physical disabilities as they move towards recovery or self-sufficiency.



PROJECT SPOTLIGHT

Myers Place

Location: Mount Prospect, Ill.

Project Type: Affordable-housing residences

Size: 31,500 square feet

Designer/Engineer: Cordogan, Clark & Associates, Aurora, Ill.

Owner: Daveri Development Group LLC, Chicago, and the Kenneth Young Center, Elk Grove Village, Ill.

Contractor: McShane Construction Co. LLC, Rosemont, Ill.

PCI-Certified Precaster: Spancrete, Waukesha, Wis.

Precast Components: Columns, beams, wall panels with a sandblast finish and three colors of inset thin brick, and hollow-core planks.



PROJECT SPOTLIGHT

Huixquilucan Home

Location: Puerto Vallarta, Mexico

Project Type: Single-family home

Size: 107,640 square feet

Cost: \$5 million

Designer/Engineer/Contractor: Zyman & Zyman, Huixquilucan, Estado de Mexico

PCI-Certified Precaster: Pretecsa, Altizapan de Zaragoza, Estado de Mexico

Precast Components: 1,600 acid-etched architectural panels



Images by Karen Weber ©Fotosconcreto.com

This 107,640-square-foot, single-family residence in Huixquilucan, Estado de Mexico in Mexico used architectural precast concrete panels to create a personalized look that continues inside with additional precast panels.

didn't have to add any extra acoustical materials to dampen noise," says Thompson.

The project is in the process of being LEED certified, offering such sustainable features as geothermal vertical heat pumps. The precast concrete system contributed to the sustainable goals by being produced within 500 miles of the site, using local materials in the manufacturing process, incorporating recycled materials, reducing site congestion, limiting construction waste, and providing a recyclable material.

The result is a dynamic, attractive housing option that provides sustainable, affordable housing that was quick to construct, allowing tenants faster access to their new homes. The total precast concrete system also inherently provides passive fire protection and resiliency, such as protection from storms.

Single-Family Home

Precast concrete also can be used for single-family homes, creating distinctive looks and providing benefits that other materials can't offer. An example can be seen in a large residence built Puerto Vallarta, Mexico. The expansive, 107,640-square-foot mansion used architectural precast concrete panels to create a personalized look for the home that continues inside with additional use of precast panels.

"The construction of this great house demanded challenging architecture and precise execution, such that the architectural precast concrete wall panels presented an ideal solution to solve both requirements," says Erick Ginard, communications manager for Pretecsa, the precast manufacturer on the project.

Built in one of the most exclusive developments, the three-story residence features an exterior of architectural precast concrete panels created with precise lines of reveals that continue from one panel to another in varying widths in different locations. "The detailed walls, both indoors and outdoors, were designed to resemble infinite roads, which serve as a metaphor for journeys taken around the world," he explains. The designer, Jack Zyman of Zyman & Zyman, was inspired in his design by a quote from 1800s Irish writer George Moore, who wrote, "A man travels the world in search of what he needs and returns home to find it."

"The precast concrete architectural panels allowed the design team to play with colors and finishes during the creative stage, imagining different patterns and maintaining a simple yet still attractive design point," Ginard explains. "They worked with Pretecsa to gain economies through repetitive patterning and used a natural scale to keep the building from being too overwhelming."

Maintaining the fluid reveal pattern in different sizes across all panels required close coordination of plan and craftsmanship. The precaster created molds from glass-fiber reinforced concrete to cast the panels, allowing for the largest possible number of pieces to be cast from the same mold. "This approach made it possible to create perfectly straight grooves in all the panels, ensuring a perfect continuity of the installed smaller pieces," he says.

'The precast concrete architectural panels allowed the design team to play with colors and finishes during the creative stage.'

More than 1,600 elegantly acid-etched pieces were fabricated with straight grooves, using beige aggregates and white cement. They were designed to complement and interface with a variety of other materials on the home's exterior, including wood and steel. "The goal was to combine materials in a perfect combination of elegance and modernity," Ginard says.

A key challenge came in creating a panelization system that kept panel sizes and weights small enough to be erected without requiring a crane. "This necessity complicated the manufacturing and installation of the precast concrete elements, which required keeping the panels horizontally aligned with the maximum degree of accuracy," he explains. Each panel covered no more than eight square feet.

"The precast concrete panels and installation process provided a clean working environment at the site," Ginard notes. "In a very short time,

the house looked sharp, clean, and finished, which allowed the owners to adapt the interiors to their specific decorative needs."

The panels were erected onto a light steel frame anchored to the building structure. This provides a framework that allowed the panels to be erected and adjusted as needed. In all, the panels, covering 12,500 square feet, were erected in only four weeks. Panels also were used for interior walls in some locations, providing continuity as visitors arrive.

The result of the attention to detail is a large home that provides a welcoming atmosphere with a highly contemporary appearance. "Precast concrete elements provided a great solution for this single-family home," says Ginard. "It adds a touch of distinction and modernity to the project, a pictorial composition with precise lines in a visually homogeneous construction. The result is truly spectacular."

Ritz Carlton Residences

The Ritz Carlton Residences along the Baltimore harbor front contains 192 luxury condominiums with expansive views of the inner harbor. That amenity was articulated by the six-story, finger-like segments connected by four-story, interstitial sections between them, creating a series of view corridors along the length of the building. Architectural precast concrete panels on the lower floors of the 793,000-square-foot building combine with brick masonry on the upper floors to reduce the scale of the large building and create a distinguished façade.

"We looked at a variety of materials to find the best blend of options," says Michael Blake, principal and partner in Marks, Thomas Architects, the architectural firm on the project. "Precast concrete was very economical, especially with the large size of panels we could produce. As designers, we like precast concrete and like to see it being used because of its combination of aesthetics, economy, and speed."

Its aesthetics was as important as the other factors, he notes. "This is a large and prominent project on the waterfront, and we wanted to invoke a quality of permanence for this substantial building. The large-panel precast concrete assembly was a good fit." Gate Precast Co. fabricated the precast concrete components for the project.

The owners wanted the building's

PROJECT SPOTLIGHT

Ritz Carlton Residences

Location: Baltimore, Md.

Project Type: Condominium complex

Size: 793,000 square feet

Cost: \$155 million

Designer: Marks, Thomas Architects,
Baltimore, Md.

Owner: Midtown Baltimore LLC,
Baltimore, Md.

Structural Engineer: SK&A
Structural Engineers, Potomac, MD.

Contractor: Bovis Lend Lease,
Bethesda, Md.

PCI-Certified Precaster: Gate Precast Co.,
Winchester, Ky.

Precast Specialty Engineer: Engineer-
ing Techniques, Front Royal, Va.

Precast Components: 88,474 square
feet (1,264 pieces) of architectural
components, 129 with punched
windows, column covers, cornice
panels, and quoin panels.

Designers considered a variety of cladding options for the 793,000-square-foot Ritz Carlton Residences along the Baltimore harbor front before deciding on using architectural precast concrete panels on the lower floors and brick masonry on the upper floors.



Photo: Commercial Photographics:
Photography by Jeffrey Sauers



Photo: Paul Burk Photography



Photo: Paul Burk Photography



Photo: Commercial Photographics:
Photography by Jeffrey Sauers



Photo: Commercial Photographics:
Photography by Jeffrey Sauers



Photo: Commercial Photographics:
Photography by Jeffrey Sauers

presence to suggest a “classical elegance,” Blake says, which led to the combination of precast concrete, brick masonry, and cast-stone accents. The brick consists of traditional flashed red “molded” units, a style rooted in Maryland’s history. “Its textural quality lends itself to a residential scale and feel, which was important for a large structure like this,” he says.

The architect visited the precaster’s plant to view operations and discuss options, working with the company on a design-assist basis. “We had terrific meetings,” Blake says. “We worked out the aesthetics we could achieve and discussed ways to design and fabricate the panels as cost-efficient as possible. We looked at ways to create the primary panel types to aid repetition and reduce costs. We worked really closely with them to make it all happen.” Panel sizes were maximized to limit the number of lateral tie-backs that were needed reducing the number of let-outs in the back-up wall assembly and subsequent patching required after the panels were in place.

The design incorporated vertical relief panels and projecting pilasters, adding detail, depth, and articulation. “Double soldier-course banding and window lintels, in concert with the integration of cast-stone surround detailing at windows, contributes to the richness and quality of the building’s classical architecture,” he says.

A key element was the use of deep reveals to create shadow lines that change as the sun moves overhead. “Achieving those deep shadows was important to us, and we couldn’t have gotten them with any other material.”

The building features a variety of balconies to take advantage of the views, and to provide depth and interest. These were clad with precast concrete spandrel panels. “The utility of the precast concrete allowed the construction criteria to be satisfied and was essential to the balcony feature’s success,” he says.

Scheduling also was critical on a project of this size. The site was constrained by a busy highway on one side and the harbor on the other. “Access was really very minimal, so we had to coordinate delivery of our loads closely,” says Mark Pedron, vice president of operations at Gate Precast. Multiple tower cranes were used, but they had to be coordinated

closely, as they were used continually and had to often be repositioned to reach the appropriate locations on the huge site around the restrictions.

Ledges were cast into the tops of the precast concrete panels, which were attached to a cast-in-place frame, to provide support from the precast for the brick levels. But the design also allowed the option of developing independent support for the upper floors of brick. This allowed the precast panels to be erected after the upper levels of brick had been laid if needed, as well as allowing the brick to be in-filled after the panels were erected. This option eliminated the need for extra steel to support the brick. In some areas, the brick was installed before the precast panels below them had been erected.

‘The utility of the precast concrete allowed the construction criteria to be satisfied and was essential to the balcony feature’s success.’

“Baltimore and the mid-Atlantic region is very competitive for masonry and has a long history with it,” Blake explains. “We wanted to combine precast concrete and brick while tying the two together and provide more dimension to the project.” The panels were designed so they wouldn’t impose gravity loads on the second- and third-floor slabs, allowing minimal slab depth.

“Each part was choreographed for each crane, so we could tell our trucks exactly where they had to go and in what order they had to be there,” Pedron explains. “It was highly coordinated because of all the detail on the panels. They had to be in the right order.” Breaking the building into sections allowed each portion to be completed before moving onto the next one, allowing pieces to be cast to fit that portion.

“Meeting each milestone of completion was a key focus,” he notes. “With so many trades on site and cranes being scheduled tightly, we

knew it would either look like a ballet or a car crash.” The coordination proved worth it, he adds. “We completed the elevations in about one-third of the time as could have been done with conventional masonry. We worked to get trades up to install windows quickly and let interior trades start work and get everyone else off-site.” Many of the panels were delivered at night to avoid traffic congestion and ensure they were ready for erection in the morning.

Working with the precaster early in the project on a design-assist basis ensured the design was simplified to the extent that it maximized the repetitive nature of the panels while maintaining the design intent. “This approach reduced the lead time required for delivery,” Blake explains. “It allowed for efficient production and erection of the precast concrete in what would have been a complicated logistical challenge. The project schedule really benefitted from it.”

A finishing touch was supplied in a precast concrete arch that marks the entry and frames the water view from the boulevard. “It helps to successfully integrate this large, new building into its context,” Blake says. Even that design created challenges, as it had to be delivered under an arched bridge to the interior courtyard once exterior pieces already were in place.

The result of this close coordination is a monumental building that belies its immense size by creating a homey, residential feel with dramatic views. “Everyone was committed to maintaining the design intent and working efficiently,” says Blake. “Flexibility in precast concrete design, finish, and construction allowed for a quick enclosure while adding seamless design integration with other conventional construction materials on the project.”

These examples show some of the range of precast concrete’s capabilities in creating residential projects of any size, architectural style, and location. Taking full advantage of the versatility, efficiency, and resiliency of high-performance precast concrete helps ensure that architectural and marketing goals can be achieved to create aesthetically pleasing, quickly constructed, and cost-efficient residential buildings. 

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