SHORT Learning Curve

Designers on a second mixed-use building in project value-engineer initial structural system to feature more precast concrete components, adding cost savings and aesthetics

— Craig A. Shutt

Zaragon West in Ann Arbor, Mich., was designed as the second of two buildings developers created to implement the city's goal of adding high-density housing, structured parking, and ground-level retail space under new zoning regulations. To achieve its goals as cost-efficiently and in as aesthetically pleasing of a manner as possible, designers value-engineered the first building's design to add load-bearing precast concrete walls to the planned hollow-core slab.

The U-shaped building, planned to serve as student housing for the nearby University of Michigan, followed the construction of Zaragon Place. Built on a smaller footprint, that facility was constructed with load-bearing masonry walls above the base to support hollow-core slab. "It took a long time to get the shell erected and to fully enclose the building," says Scott Bonney, project architect at Neumann/Smith Architecture. "Then we had to lay the brick and install the windows, which turned into a lengthy process."

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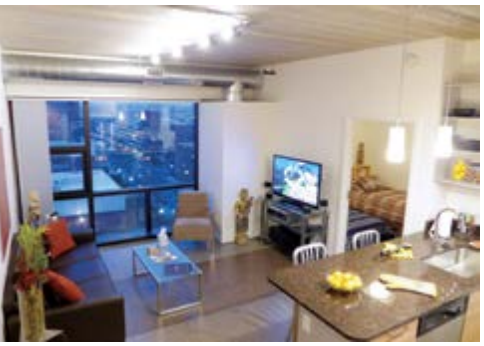
Student housing usually requires a schedule that ensures opening before the new school year begins. In this case, the developers had planned the schedule so the building could open in mid-year if possible, ahead of the drop-dead date. The construction team met that earlier schedule, providing plenty of time to get it ready for the new school year. "The developer was willing to open ahead of schedule if that could be achieved, and that's what we did," Bonney says.

The two buildings were planned to offer "an alternative lifestyle for residents seeking dramatic and flexible living spaces in a state-of-the-art building," explains Bonney. "Safety, security, a central location, and high-tech amenities are a few features that establish Zaragon West as a premier address."

TIMELESS APPEARANCE
Precast concrete helped the building project a timeless appearance that offered high durability. Photo: www.jmaconochie.com.



STUDENT HOUSING
The precast concrete walls aid both noise suppression and durability in the residences, which were designed to be student housing for the nearby university. Photo: NeumannSmith.

The 14-story building features 80 loft apartments on levels 4 to 14, entered from a ground-floor lobby. Retail space is located on the first floor, including a fitness center and pizzeria with seasonal outdoor dining space. "It adds to the vibrant street frontage along this important urban intersection," Bonney explains. Two levels of parking for 40 cars are available on floors 2 and 3.

DURABLE AND TIMELESS

The design concept for the two Zaragon buildings was to use "highly durable and timeless building materials," Bonney notes. Designers wanted to complement the historic State Street

ZARAGON WEST

LOCATION
Ann Arbor, Mich.

PROJECT TYPE
Mixed use (parking, retail, residential)

SIZE
133,862 square feet

COST
$25 million

DESIGNER
Neumann/Smith Architecture, Southfield, Mich.

OWNER
Zaragon, Chicago, Ill.

STRUCTURAL ENGINEER
Desai/Nasr Consulting Engineers, West Bloomfield, Mich.

CONTRACTOR
O'Neal Construction, Ann Arbor, Mich.

PCI-CERTIFIED PRECASTER
Kerkstra Precast Inc., Grandville, Mich.

PCI-CERTIFIED ERECTOR
Assemblers Precast & Steel Service Inc., Saline, Mich.

PRECAST COMPONENTS
10-inch hollow-core slabs, 8-inch solid panels, 10- and 12-inch solid slabs, rectangular beams, specially sized beams, and stairs.

neighborhood and create an iconic appearance. The exterior shell features cast-in-place concrete on the lower three levels of retail and parking with load-bearing precast concrete walls and floors above.

Portions of the top stories feature a dramatic two-story glass curtain wall, allowing larger living rooms and bedroom windows on six special two-bedroom units. The building is capped with a cantilevered anodized aluminum sun-shade system, providing a modern "crown."

"The architectural style combines traditional urban high-rise residential typology, with classic forms of a base of cast-in-place concrete, a central area of brick-faced precast concrete, and a top part with glass," Bonney explains. The brick facing was laid up onto the precast concrete walls once they were erected. To meet zoning requirements, the building steps back 5 feet at the fourth-story street frontages, where the precast panels begin, defining a three-story-high streetscape.

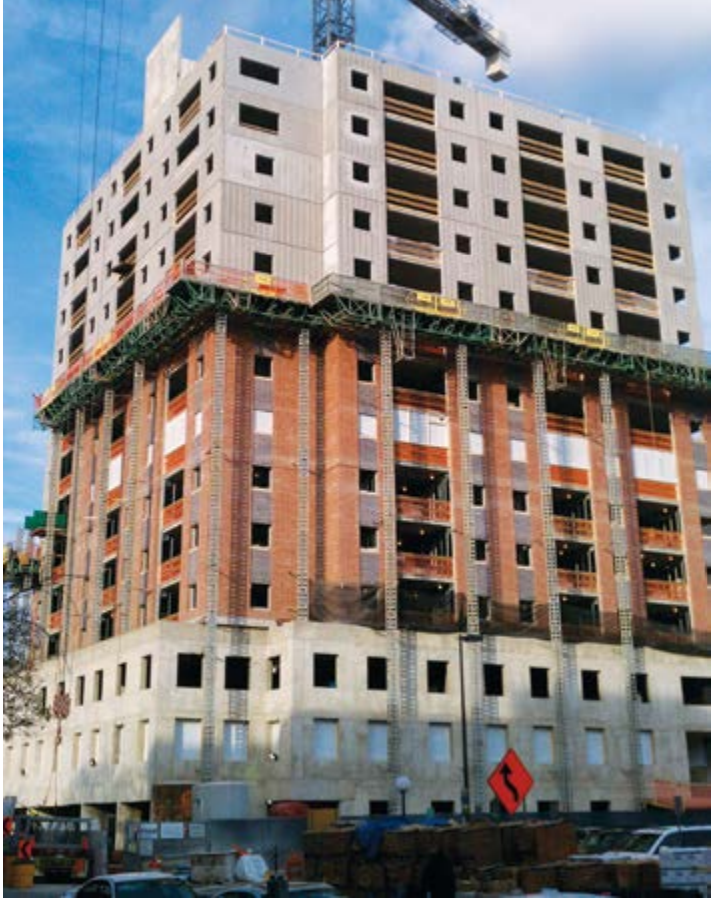
Developers wanted to ensure high levels of sound attenuation and durability for the residential units. Precast concrete panels were used throughout the project, in some cases as demising walls but also as structural supports between units.

"As student housing, the residences require quiet for those studying, and they also needed to be durable, as they can get beat up easily," Bonney explains. "Precast concrete helped achieve both of those goals." The layouts alternate bedrooms against living rooms, helping to reduce noise from competing spaces between units, he notes. In some cases, those walls are load bearing to provide additional interior support, although most are demising walls.

PANELS REDUCE MAINTENANCE

The precast walls also will reduce long-term maintenance needs, a goal the owner requested. "Zaragon Place features painted masonry walls on the interior side, and that's going to cost significantly more over time to maintain," he says. For Zaragon West, the panels were cast with a smooth, highly finished side to lay up the brick against, while the interior side features a finish nearly as smooth that could be painted easily. "It created an extremely flat surface that provides a nice aesthetic touch."

The panels were cast with brick tie-channels for the dovetail anchors to secure the hand-laid brick into the panels quickly and easily. A layer of insulation was applied between the panels and bricks to increase energy efficiency. "It was extremely easy to tie the brick veneer and the insulation to the precast concrete because we planned the panels so brick could be attached after the fact."



BRICK FACING
The façade's brick facing was laid up onto the precast concrete walls once the load-bearing panels were erected. Photo: www.jmaconochie.com.

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The key challenge for the precast concrete walls came in coordinating the load path from the panels down through the cast-in-place podium base, explains Steve Haskill, estimator and project engineer with Kerkstra Precast Inc. "We had to work closely with the cast-in-place concrete supplier to coordinate the accuracy of placing the precast panels on the base, as those load paths were critical. Our early communication with them allowed it to move smoothly once the panels began to be erected."

A transfer structure was created between the two layers to ensure the loads from the precast panels followed the proper paths to the ground. Segregating the retail spaces from the parking didn't present an issue due to the small amount of retail. "We needed a fire-separation wall between the parking and the housing levels, but the concrete base and hollow-core slabs provided that inherently," Bonney says.

SECOND TIME WORKS
The shell was erected quickly thanks to replacing the masonry-wall design from an earlier similar building with load-bearing precast concrete panels. Photo: Kerkstra Precast.

The panels were cast with haunches that provided a wide, secure support for the hollow-core plank. "The haunches provided a nice additional benefit to using precast panels," says Bonney. "They gave us 12 inches of bearing plate to rest on, which reduced the precision needed to set the slabs. We could create efficient layouts with few added connections." The framing produced 9'8" ceilings for each unit.

Conduit running into each unit was connected to the hollow-core and left exposed. The bottoms of the slabs were left exposed in their natural gray color. "I wanted to express concrete's rugged and honest aesthetic," he says. "With the smooth concrete finish available, I didn't want to hide it behind drywall. I wanted to celebrate the material's engineering, and this was an ideal application of that concept."

'The haunches provided a nice additional benefit.'

The 4-foot-wide plank module was reflected in the 4-foot pattern of two colors of recycled rubber flooring used with a topping on the flooring side. "There was no reason to hide such a handsome material."

The long, 10-inch-deep hollow-core slabs allowed layouts to feature bedrooms flanking a large great room. "That helps to accommodate flexible lifestyles and add more leasing options while eliminating long corridors within units," Bonney explains.

Sunscreens were attached to the window-wall system to provide sun protection for the glass curtain wall at the top, providing projections that added dimension at the building's top.

COMBINING FUNCTIONS

Delivery of components was hampered by the zero-lot line, which provided no opportunity to stage materials at the site. Just-in-time delivery was used, with some traffic lanes closed for short periods on occasion. "We staged the precast off-site, had it delivered to the site, and picked it for immediate erection," says Bonney. "It was quite the choreographic process to see it happen."

Trucks were scheduled to arrive as needed, one after another, adds Haskill. "We had two or three on the road at once from the staging site, arriving and having the pieces picked and then returning, with the next truck moving up into place." The precaster's plant was a 2-hour drive away, so coordinating all the way back to the plant posed no challenges.

The panels were erected at a speed of approximately one floor per week, with all 11 floors finished in 12 weeks. "It went significantly faster than the first project had gone up," says Bonney. "That ensured we could put the roof on quickly and then set loose the trades to do plumbing, wiring, and finishes."

The first building's masonry and brick approach provided a more finished façade as the materials went up the floors, he notes, but that wasn't critical. "It took forever to get to the top. This time, getting the precast walls in place was important because we could cap the building and make it watertight. Then we could take our time to finish the brick-wall system while trades were working inside. Once we got the brick out of the critical path, we didn't have to worry about weather conditions or how soon we could get inside."

The second and third levels were clad with cast-stone veneer to shield views into the parking levels. Punched rectangular openings in the façade allow the deck to be naturally ventilated without exhaust fans.

Being watertight was a significant benefit, he adds. "For the first project, we had to deal with a lot of rain, drying out the interiors and channeling the water so it wouldn't leak into elevator and duct shafts. Getting the walls up quickly on the second project all the way to the roof minimized any water infiltration that can be hard to clean up."

The construction was timed so the precast concrete could be erected in mild weather, he notes. "By the time harsher weather hit, most of the work was being done inside." A tower crane was used to erect the panels and hollow-core. "Knowing that going into the design, we could plan on that format to maximize panel sizes to fit the crane's capacity," notes Haskill.

"Especially for such a narrow site, with little room to work, the precast walls and floors went up incredibly quickly," Bonney says. "An additional benefit was that, since both products were provided by the same supplier, there was smooth communication between the two elements to ensure they fit together well. Combining those activities provided a huge savings and eliminated any finger-pointing by trades that blame the other when interfaces don't work and schedules slow down."

Value-engineering the system resulted in an efficient design that met all the goals on time and budget. "This project went so much faster than the previous one," says Greg Kerkstra, president of Kerkstra Precast, which provided the hollow-core for that building too. "The learning curve from that project was applied very well to this one."

Adds Bonney, "We recommend this system to many of our clients. It saves so much time, which can really make a significant difference in cost and time savings, as well as long-term maintenance."

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ACTIVE RETAIL
First-floor retail space adds activity along the street frontage at a key urban intersection. Photo: www.jmaconochie.com.