Precast Design Provides Structural Versatility

Precast structural system on skilled nursing center in Denver saves time and material while meeting all of the facility's specialized needs

— Craig A. Shutt

Physical-therapy facilities are expanding their capabilities to better serve patients, providing more in-depth services that bridge the gap between hospital stays and returning home. The Center at Lincoln in Parker, Colo., provides those services, after community members in the Denver suburb decided existing facilities weren't sufficient. The design-build team chose a precast concrete structural system (or total precast system) that provided the structural and aesthetic versatility that the skilled nursing center needed to meet its goals.

The center, which features 96 private resident rooms, provides physical-therapy services of all types to patients who no longer need on-going hospital care but require full-time services prior to returning home. It offers a variety of facilities for occupational and speech therapy, as well as complex nursing care. The 80,000-square-foot center includes a 4,000-square-foot gym, fine-dining kitchen, media/theater room, multiple activity rooms, and an outdoor therapy garden. Patients stay a minimum of five days and receive up to 720 minutes of therapy per week.

"The center was opened as a result of community members who arrived at the conclusion that the status quo in skilled inpatient rehabilitation

When the original steel and masonry design for The Center at Lincoln, a skilled nursing facility in Parker, Colo., proved economically unviable, a total precast concrete system was used. It consisted of 64-foot-long double tees, columns, beams, and load-bearing architectural wall panels. Photo: Rocky Mountain Prestress.

The two-story, upper-level panels feature a darker color in a flagstone texture, while the first floor used a buff-colored limestone look with wide reveals. The rectangular pattern continued onto all four sides of column covers on the entry colonnade. Photo: Rocky Mountain Prestress.

was inadequate to satisfy patients' needs," according to a center spokesperson. "Prior to its opening, patients who required skilled nursing and rehabilitation had few choices other than be admitted to a traditional nursing home. The center provides additional choices to patients seeking rehabilitative care."

The developer, Development Solutions Group, tasked the design-build team with evaluating multiple framing and building-skin systems to find the one that best met the nursing center's needs. "We looked at a variety of options, and it came down to steel and masonry versus precast concrete," explains Gary Constant, vice president of preconstruction services at GH Phipps, which led the construction team on the design-build project. The key driver was the architectural standards set by the business park in which the center was located. Those required a brick or stone exterior appearance.

"Once it was set that we needed a high-end finish, we gravitated to the precast concrete option for the benefits it could provide." Phipps then worked with precaster Rocky Mountain Prestress (RMP) to consider formliner and color options to create a variety of finishes. Once that was set, moving to a total-precast concrete system was a simple matter, he says.

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"We always go for the precast concrete structural system if we're using architectural panels," Constant says. "They can make the panels load-bearing and cast a lot of double tees very quickly, which makes them economical."

RMP provided 64-foot-long double tees with 24-inch stems, which added more benefits. "This design eliminated an entire beam and column line in each wing while creating virtually column-free spaces," explains Mike Hemberger, director of business development at RMP. "The single-span double tee provided a very efficient, cost-effective member."

Creating clear spans not only provided interior design flexibility but eliminated the need for foundations in the center of the building, where poor soil conditions would've made them more complicated, Constant says. "Pouring foundations only for the perimeter saved us time and money."

PPROJECT SPOTLIGHT

The Center at Lincoln

Location: Parker, Colo.

Project Type: Skilled nursing facility

Size: 80,000 square feet

Designer: HDR Inc., Denver, Colo.

Owner: Development Solutions Group Ltd., Denver, Colo.

Contractor: G.H. Phipps Construction Cos., Greenwood Village, Colo.

PCI-Certified Precaster: Rocky Mountain Prestress Inc., Denver, Colo.

Precast Specialty Engineer: FDG Inc., Arvada, Colo.

Precast Components: Total precast concrete structural solution including columns, beams, 64-foot double tees and load-bearing architectural panels

Two-story bay windows reflect the rounded curtain wall used at the entry. The windows rest on a curved precast concrete slab that cantilevers off the wall panels. Photo: Rocky Mountain Prestress.

The design consists of precast concrete columns, beams, double tees, and related structural components supported with load-bearing architectural precast concrete panels with multiple finishes. "The load-bearing design provides vertical support plus lateral restraint," Hemberger explains. "This approach provides an efficient, durable design that's easy to erect and very attractive." The designers also used grouted couplers and intermediate shear walls to enhance foundation efficiencies.

Two Wings Aided Repetition

The building features four wings projecting out at an angle from the central glass-enclosed curved entry at the center. "The wings are almost identical in design, so they allowed for a lot of repetition in casting panels," notes Degan Hambacher, president at FDG Inc., the precast concrete specialty engineer. "That sped up construction and made the design more economical."

The wings' angle creates a curved, welcoming shape that draws visitors to the entrance. The entry's curved curtain wall on the upper two floors cantilevers off prestressed precast concrete supports and sits on a cast-in-place ledge. "There were some gymnastics needed to create the curtain wall at the colonnade, but Rocky Mountain did a good job accommodating the needs," says Constant. "We worked closely with the engineer, precaster, and specialty engineer to ensure that constructability remained a key goal throughout the process."

A curved cornice was added to the panels on the top floor, creating a distinctive roofline. Photo: FDG Inc.

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This curved entryway is reflected in curved bay windows on the second and third levels of each wing end. The windows sit on cantilevered precast concrete slabs that match the curve of the window projections. Other fenestration in the center consists of punched windows that were installed once the precast concrete panels were erected.

Two Finishes Featured

The three-story center features two concrete finishes, with a buff-colored, limestone-like appearance on the first level with wide reveals creating block-like rectangles. These walls are supported by slab-on-grade foundations. The design continues onto column covers that support the entrance colonnade, with two architectural half-column panels integrated to form the structural column.

The upper two levels feature a flagstone finish in a darker hue, cast from one of RMP's standard formliners but turned in different directions to ensure no two adjacent blocks had similar textures. A complementary band of the buff-colored texture separates the two floors and lines the roof line, where an integral overhanging cornice provides definition. "The cornice detail is a standard feature we can provide, but we don't often get the opportunity," says Hemberger. "It adds a nice complex feature, and we enjoy adding those details whenever we can."

The panels were cast to clad each floor separately, but many required several finishes, reveals, and cutouts. "We were able to cast panels with two colors and a variety of details without any problem, which created more efficient pieces to be picked and erected," says Hemberger.

Penetrations No Problem

Laying out interiors provided no unusual challenges, says Hambacher. Sensitive equipment is located on the first level, which consists of slab-on-grade flooring, so the double tees didn't have to account for vibrations, he says. Providing the required penetrations for utilities and other services created no problems, despite initial concerns by the architect that the double tees would limit penetrations options.

"One of the biggest misperceptions of precast concrete is that it's not flexible for medical-center designs dealing with MEP coordination and future modifications and load changes," Hemberger says. "This project demonstrates that this is not necessarily the case. The MEP coordination went very well on this project."

The key concern was that patient-room layouts on the upper two floors required bathrooms to be located in specific locations. "We were told that no plumbing

could be moved, and we had to move stems to accommodate the plumbing," Hambacher explains. To accomplish this, blockouts were cast into the stems at key locations, allowing plumbers access to the penetrations. They installed elbows that then ran alongside the stems.

In some cases, double-tee positioning was reworked. "We could adjust our modules if needed to create the floor penetrations they needed," Hemberger says. "It worked very cleanly in the end." The 10-foot-wide double tees were adjusted by as much as 2'2" in width to avoid any conflict of penetrations with the tee stems. "We can crop one wing and move it to accommodate whatever needs there are."

Levels were designed to be 14 feet tall, with dropped ceilings installed beneath the two-foot stems. The plenum provided sufficient space for mechanical needs.

The open site allowed for fast erection of components, with two cranes used to erect the two wings simultaneously. This accelerated construction, allowing the facility to open earlier. "The panels erected just like a layer cake and went very quickly," says Hemberger, whose company also did the erection.

Speed a Key Factor

That speed was a key factor in choosing the precast concrete system, notes Constant. "The hard costs between the steel-masonry-fireproofing option versus precast concrete were fairly neutral," he explains. "But the precast provided a lot of added benefits, especially in speed of construction. The precast design took six weeks off the schedule, which meant six fewer weeks for the developer to carry loans and interest on the development. That tipped the scales, because we could save time and money."

'The precast provided a lot of added benefits, especially in speed of construction.'

Panels feature several colors, reveals, and a variety of cutouts. Combining colors and textures into one panel reduced the piece count and sped up the erection process. Photo: FDG Inc.

Blockouts were cast into some of the double tees to allow penetrations that plumbers could connect to an elbow, allowing plumbing to remain set in the design. Photo: FDG Inc.

The precast system also eliminated scaffolding from the site, improving safety and allowing site work and landscaping to begin earlier. "That's really a great benefit," he says. It also provided inherent fire proofing. "We needed I-Occupancy fire rating, and the precast concrete structural provided that at no cost—literally."

RMP had worked for the developer on other properties, so they were familiar with the benefits of precast concrete. But this was the first time the precaster had supplied components for a skilled nursing center. "We do a lot of medical office buildings, but nothing along this line in the healthcare field," says Hemberger. That could easily change as more designers see the benefits that a total-precast concrete structure can provide in energy efficiency, speed, and cost effectiveness.

Constant agreed. "Being involved at the conceptual stage ensured we needed a solution that cured a lot of the challenges, and the precast concrete system did that. It reduced foundation needs, provided a high fire rating and clear interior spans, reduced site congestion, combined all exterior pieces into one supplier, met aesthetic requirements, and finished six weeks early. That's a great combination."

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