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CASE STUDY

Surgery Center Built Atop Precast Parking Structure

Precast 'mega-tees' and early input from precaster create vibration-free construction in tight urban setting

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Developers at St. Peter's Medical Center in New Brunswick, N.J., faced a key dilemma when they decided they needed a new Ambulatory Surgery Center. The only available space near the existing complex was a surface parking lot — and the loss of those parking spaces in a virtually land-locked urban location would worsen an already severe parking shortage. The hospital's designers found their solution in precast concrete components, which met the needs for structured parking, as well as for the new high-tech facilities.

The obvious solution to the space dilemma was to combine the parking and surgery functions into one multi-function facility. But designing this space wasn't that easy. Under normal circumstances, designers would have placed the surgery center beneath the parking structure. But the need to work with the existing medical facility dictated a direct link to the new ambulatory surgery center for staff and patient transfer.

The desire for speed and single-source responsibility led to designing a structural precast system.

Placing the parking structure beneath the surgery center resulted in some unconventional thinking on the part of the design team. That group included development and architectural firm American Medical Buildings (AMB) in Milwaukee, and its consulting architect and engineering firm, Desman Associates of New York City.

"Conventional thinking would have suggested that the parking structure be constructed using precast concrete, then building a transfer floor and switching to a steel frame for the surgery center," explains Tom Basile, project manager for Desman Associates.

But Desman's designers examined the project's factors and determined two things. First, the number of parking spaces in the project was critical, precluding the use of a short-span framing system and pointing the project toward long-span structural precast concrete members. Second, an aggressive construction schedule made it obvious that bringing in two different contractors — one to erect the structural precast and a second to do steel work — would significantly hamper the need for speedy completion.

Precaster Involved Early

Desman's team convinced the designers to consult with a structural precast manufacturer during the pre-construction phase to both advise on design issues and secure a design and production slot in the precaster's schedule. They selected High Concrete Structures Inc. in Denver, Pa., and with the company's input, the team explored the possibility of constructing both the parking structure and the space above using precast structural components. This would allow both structures to be erected in a single, continuous process.

The need to provide a pedestrian link from the new addition to the existing facility played a major role in the decision to place the surgery center atop the new parking structure. Photo: JP McKenna, Architectural Photography

The ultimate structural design uses long-span precast framing members, including 15-foot wide "mega tees" that reduce the number of pieces required. Also included are structural precast spandrels, cast to accommodate a brick facing for the façade. "Not only did the system meet the construction schedule, but it had an ancillary benefit as well," says Basile. The structural precast gave the entire project a natural fire rating, as well as providing fire separation between the different uses without the need to add extra protection.

"We needed an extremely stiff structure for the surgery center," says Jack Amormino, president of AMB. "Plus, we were working within an extremely tight time window and on a tight budget. I doubt seriously if we could have met those constraints were it not for the decision to use precast throughout the structure. Once we made that decision, the precaster could begin design work on the structural members while we began site work."

Vibrations Were Concern

To limit the vibrations that inevitably occur in a long-span precast parking structure, the team consulted with Tacet Engineering Ltd. of Toronto, a vibration specialist. Tacet's engineers suggested that an additional 4 inches of concrete topping be poured atop the standard 4-inch double-tee floors and a custom bridge-style bearing assembly should be used under all the double tees directly below the surgery floor. Once that challenge was met, the design-build team was able to proceed with planning and construction. "That solution was critical to the success of the project," says AMB's Amormino. "Any vibration whatsoever would have been unacceptable in an operating room environment."

The precaster's early involvement with the construction manager and developer in the preconstruction phase was a key reason for the project's smooth progress and ultimate success, according the Michael B. Achilles of High Concrete. "The fact that we were able to get in early helped solve many of the logistical problems." The site was locked in on three sides with only one major street for access on one side of the project and the city of New Brunswick looked askance at blocking that off for any length of time, he says. Careful coordination of production and delivery of concrete components solved that problem.

The precaster's early involvement solved many logistical problems.

"Instead of blocking the street off for months, which was clearly unacceptable, we were able to get a crane on site early on and set up. Then, by carefully coordinating delivery, we were able to bring components to the site on flatbeds and erect them, closing one lane of traffic only in off-peak hours," Achilles explains.

The careful coordination during the preconstruction phase paid off, according to Michael Kasian, vice president and project executive for the construction manager, Morse Diesel International Inc. (now Amec) of New York City. "We hit the ground running and once we began, erection went quickly and very smoothly," Kasian says. The erection process, including pouring pads for the HVAC equipment on the fourth-floor surgery center, was completed in just 12 weeks. It was accomplished with just one crane, which was assembled in the street and walked onto the site.

Decorative medallions at the corners of the new structure's parking lot match the exposed concrete of the surgery center above, while brick blends with the existing medical center at right. Photo: JP McKenna, Architectural Photography

"This was clearly the quickest and most cost-effective way to complete the building," Kasian says. "Overall, construction took 14 months from start of excavation to turnover of the surgery center to the hospital, with all state approvals included, a major accomplishment in healthcare construction."

Schedule Cut By Three Months

Using precast concrete for both parts of the new structure cut at least three months off the construction schedule, says Basile. Precast, prestressed concrete was used for both structural and architectural elements. The exterior features prestressed spandrel panels and precast shear walls with brick cladding to match the existing campus buildings.

In all, the structure includes 81 columns, 69 girders, 24 beams, 135 spandrels, 17 "lite" walls at the parking ramp, 120 stair/elevator shearwalls, 28 stair units including landings, 39 solid slabs, 267 double tees and 206

St. Peter's Medical Center in New Brunswick, N.J., constructed its new Ambulatory Surgery Center atop its new parking structure using a precast concrete structural system for both. American Medical Building's development approach created efficiencies in time, cost and access for the hospital. Photo: JP McKenna, Architectural Photography

Get An Early Start

All parties involved in the St. Peter's Ambulatory Care Center project agree on one basic principle: Involve the entire construction team as soon as possible. "By bringing High Concrete Structures in at the earliest possible stage of design, we were able to determine that precast could be used throughout and that the building could be erected in one continuous process," explains Tom Basile, project architect for Desman Associates.

Jack Amormino, president of AMB Development, agrees. "Having High Concrete on board from the start helped considerably in the decision-making process. By working with them early as part of the design-build team, we were able to come up with a configuration for the building that met all of our concerns concerning timetable, budget, vibration and stability. The schedule moved along flawlessly, and High was able to begin fabrication of some of the building even while the design process was ongoing."

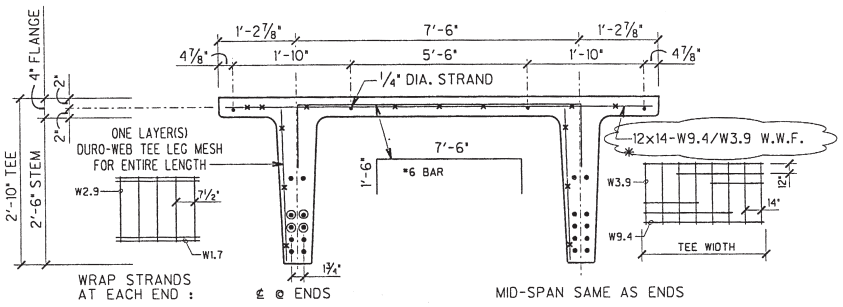
Adds High Concrete's Mike Achilles, "This building provides an object lesson for developers. Early involvement on our part allowed the developer and designer to make informed decisions and allowed solutions to problems to be developed. We were able to address concerns and point out the benefits of our system early enough to ensure that site work and fabrication could go on at the same time. That way, when erection began, we could optimize our delivery and keep a very tight schedule."

High Concrete also supplied precast stair units for the project. These were constructed outside the main bays, opening the interiors and creating a more safety-conscious facility. Photo: JP McKenna, Architectural Photography

miscellaneous coping and trim pieces.

The parking-structure portion of the building frame features 96 15-foot-wide tees for the 84,000 square feet of the elevated structure parking. Prestressed exterior spandrel elements were cast to allow installation of full-size brick in the precaster's yard prior to shipment. This eliminated the need to use scaffolding on the building, as well as the need for another trade on the site. Exposed precast on the exterior includes a buff-colored concrete mix with a medium sandblast finish. The structure ramp, located in one of the exterior bays, features stepped spandrels on the exterior to maintain a horizontal band appearance.

The parking structure was constructed with long-span concrete framing members, which alleviated an acute parking shortage for the land-locked medical center. Photo: Robert Meier, Architectural Photography



The 15-foot-wide mega tees produced by High Concrete Structures were used for the second and third floors of the parking deck. The basic unit was modified using blockouts in the casting bed to produce the 10-foot profile used in the surgery center floors .

Mega-Tees Adapted

The Ambulatory Surgery Center uses special reduced-width sections of the extra-wide tees for floor construction, measuring 10 feet wide rather than the 15 feet used in the structure. These were manufactured with a roughened deck finish to accept a field-poured four-inch concrete topping. In all, 129 of the 10-foot-wide tees created 70,000 square feet of space for the surgery center (which includes seven operating rooms plus offices) and the mechanical area. To avoid the need for additional columns in the parking structure, bay spacing echoed the 30- by 61-foot bays of that portion of the structure.

An additional 51 full-width mega-tees created the roof area over the surgery center. The float-finished, 4-inch deck was covered with rigid tapered insulation and roofing. Prestressed exterior spandrel and parapet elements feature full-sized brick installed at the High Concrete yard.

AMB's Amormino gives high marks all around for the project. "We're extremely pleased with the results," he says. "In fact, we are currently looking at using the system on another project in New York that is very similar to the St. Peter's job." ■

— Wayne A. Endicott