

PROJECT SPOTLIGHT

Hospital uses various concrete mixtures in brick-clad panels

For the Northwestern Medicine Lake Forest Hospital revitalization project in Lake Forest, Ill., the architect designed the 493,000 ft² (46,000 m²) project with a series of connected pavilions arranged in a crescent shape around a pond. The water feature was included to add a relaxing effect, both audibly and visually.

Because of the aggressive time frame, the choice for the project was precast concrete, which enabled the contractor to efficiently enclose the building to keep the interior trades working throughout the winter. Precast concrete was also the preferred choice to enclose the structural steel members that support the sunshades on the east and west faces of the buildings. International Concrete Products based in Germantown, Wis., was selected as the precast concrete producer.

The project consists of 972 precast concrete pieces and 129,501 ft² (12,031 m²) of precast concrete panels on seven buildings in one complex. The main challenge was producing brick-clad architectural prestressed concrete panels that were insulated with multiple different concrete mixtures in one panel.

A total of 159 insulated panels were produced with 9 different radii, convex and concave, with multiple different face concrete mixtures while keeping the insulation placed where it interfaced with the tight caulking zone requirements of the window system. The window system needed the precast concrete to be precisely placed so as not to interfere with the window caulking zone.

Although the project was a success, there were several challenges. One was installing the brick and multiple different-colored concrete mixtures in a timely manner to be able to install the ridged insulation and its connector pins in a wet concrete state. “This was needed in order to get the proper

bond between the insulation pins and the concrete,” says Matt Graf, executive vice president of sales and operations for International Concrete Products.

Special strike-offs were made to hold the bottom height of the concrete to a constant height so that the insulation would remain straight and on location in the panel. This location was critical because of the window system’s small caulking zone adjacent to the panels. “Temporary forming was used along the panel edges until the back lift of concrete was placed,” he says. “This prevented the insulation from moving around.”

Another challenge involved erecting the panels with a ¼ in. (6.4 mm) vertical tolerance in 230 ft (70 m), which required multiple back checks for proper elevation and the use of a fixed-story pole between the lower panel and the panel being set. “As the sunshades were loaded, they would deflect the steel, and we used adjustment bolts to realign the pieces,” Graf says.

Numerous 7 ft 3 in. (2.2 m) wide by 23 ft 7½ in. (7.2 m) tall panels that weigh 18,000 lb (8200 kg) were erected 11 ft (3.4 m) in, under the roof of the structure. “In place, it only had six inches of clearance to the bottom of the roof slab,” Graf says. “The panels were designed to be offloaded flat and perpendicular to the structure.” Access holes were formed in the concrete roof just above the top lifting points. The panel rigging was lowered through the roof, and another crane lifted the bottom of the panel to float the panel in place.

Glass protection was needed while erecting the sunshades because of the building sequence. Fire blankets were anchored to the precast concrete to keep them in place against the windows while the wind was blowing. “The anchorage points were patched after the blankets were removed,” Graf says.

“Finally, the architect did not want any steel lifting devices that crossed over the insulation,” Graf says. “Instead, an angle with headed studs and rebar, along with aircraft cable anchored to the back concrete, were used to achieve this.”

—William Atkinson

The Northwestern Medicine Lake Forest Hospital revitalization project in Lake Forest, Ill., has brick-clad architectural prestressed concrete panels that were insulated with multiple different concrete mixtures in one panel. The massive sunshades, along with the insulated panels, helped the project achieve LEED silver certification. Courtesy of Matt Graf.



Precast concrete integral to Florida dive tower

The new dive tower at the Fort Lauderdale Aquatic Center in Fort Lauderdale, Fla., is a multifaceted renovation project for this world-renowned aquatic center that has been a leader and pioneer among aquatic centers worldwide since 1928.

The city made a commitment to update and rebuild the facility with the focus of ensuring its continued legacy within the aquatic sports community. This project is the first permanent 27 m (89 ft) dive tower in not only the United States but also in the Western Hemisphere.

The tower design had to meet stringent FINA (Fédération Internationale de Natation), now World Aquatics, requirements. The design of the dive tower was vetted with the FINA Facilities Committee for the rules of diving—springboard and platform—and the rules of high diving.

This is the first dive tower in the world that incorporates diving and high diving for competitive sports competition within one structure. This innovative design has now been incorporated into the FINA facilities standard manual.

The iconic sculptural form includes nine platform levels: high diving platforms of 15, 20, 24, and 27 m (49, 66, 79, and 89 ft), and diving platforms of 1, 3, 5, 7.5, and 10 m (3, 10, 16, 24.6, and 33 ft). The tower is also designed to accommodate up to 12 springboards.

For the realization of this unique and challenging project, the general contractor led the collaboration efforts and process with the city, architect, aquatic engineer, and precaster, which was Gate Precast of Kissimmee, Fla.

The design team considered the form, function, constructibility, budget, and schedule to execute a project that was in alignment with the city's vision. Precast concrete was determined to be the most cost-effective, most constructible, and quickest to erect and also to provide the quality control assurance required to meet the tight tolerances.

Glass-fiber-reinforced concrete (GFRC) was also an important consideration. Precast concrete and GFRC can be formed off-site with strict quality control before being delivered to the site.

The design concept involved the creation of platforms extruding from a center core. Due to the design's uniqueness, the structural support of each platform was engineered specifically for each platform.

The organic curvilinear form posed challenges. For instance, the GFRC compound curves had to perfectly align with supports and connections in the architectural and structural precast concrete components. The tolerance level of precision was critical and made possible by extensive coordination and craftsmanship between partnering manufacturing facilities.

Installation of the electrical conduit for outlets, lighting, and lightning protection also required special consideration. They needed significant coordination and several trips to the precast concrete manufacturing plant by the electrician to ensure that the conduit and the electrical boxes did not inter-

fere with the steel reinforcement. The size and amount of steel reinforcement left little room to install electrical boxes for outlets and lighting fixtures, and the conduit had to line up between the stacked panels to allow a continuous path to pull wire up the tower once the tower was erected.

"Being a design-assist project, most [details] were worked out collectively," says Bruce Bartscher, vice president of operations for Gate Precast. "Design went relatively smoothly."

In terms of production, any issues that arose with GFRC production were captured during design assist. "eConstruct was a great asset during design since they are experts in GFRC design," Bartscher says.

Installation and erection were also relatively easy. "For the most part, getting the work of other trades completed prior to installation was important, but there were no more issues here than would normally occur in any project," he says.

The new 27 m (89 ft) dive tower has replaced an existing 10 m (33 ft) dive tower. The two-tone 27 m sculpture rises toward the sky with fluid curves emulating the nearby water and ocean. It sits on a beach barrier island, a 5-acre (20,000 m²) peninsula situated between the Atlantic Ocean and intercostal waterway. As such, it has been built to stand the test of time.

—William Atkinson 

Florida's Fort Lauderdale Aquatic Center dive tower uses architectural glass-fiber-reinforced concrete in its cantilever design. Courtesy of Gate Precast Co.

