Cedar City Temple in Utah features precast concrete aesthetics and durability

The owner of the Cedar City Temple of the Church of Jesus Christ of Latter-day Saints (LDS) in Utah had a lot of expectations for its temple.

"The owner provided the vision for the project, and the owner and architect then created the look they wanted," says Jim McGuire, sales manager for Forterra Structural Precast LLC of Salt Lake City, Utah, the firm that was commissioned to fabricate the precast concrete panels for the temple. "They realized that the selection of the material would really determine the look."

McGuire says, "The owner of the Cedar City Temple wanted the panels on the outside to look like chiseled stone." Using actual stone for the project was out of the question for many reasons. "The size of the stones would be limited by how large they could quarry those stones and ship them," McGuire says. "With precast, though, you can create very large panels. They can also have ornate cornices in them that you wouldn't see on a flat piece of stone." In addition, the panels are able to provide a lot of fine detail that would be expensive to achieve in stone because the detail would need to be hand chiseled.

The owner and architect opted for reinforced, architecturally finished precast concrete panels on the majority of the temple, and glass-fiber-reinforced concrete (GFRC) panels on the spires and a few other locations.

The panels were fabricated with white concrete made from white cement and a special white aggregate that enhanced the mixture to add a bit of luster. "The sand was actually imported from California to provide just the right look," McGuire says.

The GFRC, which was used in the tall, slender spires and a few other locations, is much lighter than traditional architectural precast concrete panels—about 20 lb/ft^2 (1 kN/m^2)—making it easier and safer to install on the spires. "Seismically and laterally, it made a lot more sense to use GFRC for the spires," McGuire says.

In all, Forterra fabricated 230 panels: 208 reinforced, architecturally finished precast concrete panels and 22 GFRC panels. Panels weighed between 200 and 40,000 lb (900 and 180,000 N) and ranged in size from 3 × 5 to 12 × 40 ft (0.9 × 1.5 to 300 × 1000 m).

The project was not without some challenges. "We really pushed precast to its limits in terms of amount of detail,

The Cedar City Temple of the Church of Jesus Christ of Latter-day Saints (LDS) in Utah uses reinforced, architecturally finished precast concrete panels on the majority of the temple and glass-fiber-reinforced concrete panels on the spires and a few other locations. Courtesy of Juan R. Sanchez/Forterra.

The Cedar City Temple's precast concrete panels provide fine detail that would be expensive to achieve in stone because the detail would need to be hand chiseled. Courtesy of Juan R. Sanchez/Forterra.

uniformity, color, texture, and finish of these panels," McGuire says.

"The panels have a lot of detail, so there was a lot of work required to create the different shapes and ensure the amount of detail necessary," says Brent Klopfer, project manager.

During the forming, Forterra used high-density plywood, plastic, foam, and rubber formliners. "When the panels came off the forms, they were smooth, almost like plaster," McGuire says. "The craftsmen then went through the etching and sandblasting process, which was a real art form."

If they had just sandblasted everything evenly, they would have ended up blasting the fine features off the details. "They had to approach each panel as if it were a work of art, gently finishing it to expose the sparkle in the sand and aggregate without damaging the fine details of the artwork."

There were other challenges. "One was designing the panels to meet seismic standards, to make sure that they will last hundreds of years," Klopfer says. "Shipping was a challenge, too, with the wide loads."

—William Atkinson

Precast concrete panels meet structural, design goals in Cincinnati Hospital

Mercy Health–West Hospital in Cincinnati, Ohio, was designed to become a centerpiece for the health-care center, replacing an aging facility within the network. To ensure that this goal would be met, the architect selected High Concrete Group LLC of Denver, Pa., as the precaster.

To meet the client's energy efficiency goals, the architect selected a sandwich panel design that features edge-to-edge insulation. Each panel features two solid concrete wythes, both of which are prestressed and have steel and wire-mesh reinforcement.

"The two layers of concrete combined with one layer of insulation provide a near perfect vapor and air barrier," says P. Dwayne Robinson, Midwest sales manager for High Concrete's Springboro, Ohio, office. Another reason for the selection of precast concrete was the panels' structural ability to span from column to column.

High Concrete manufactured 554 of these precast concrete panels, totaling just over 87,000 ft^2 (8100 m^2). The typical horizontal spandrel panel was 7 ft (2 m) tall and 30 ft (9 m) long, weighing about 19,000 lb (85 kN). However, there were different panel sizes throughout the project.

The panels and spandrels were clad with a thin-brick veneer that was embellished with thousands of tiles in 12 different shades of blue and green in 19 different shapes, laid out in pixel pattern, with a total area of 62,000 ft^2 (5800 m^2).

A few challenges emerged during the design process. Because the typical spandrel panel was on a radius, the panels had to be post-tensioned instead of prestressed. In addition, the glazing colors had to be transferred from the architect to the shop drawing.

Each shop ticket had a special sheet that showed where each color needed to go in the formliner. "The reason for this was that, once you push the brick into the rubber formliner, you can no longer see the glazing color," says Robinson. "Each brick was numbered on the back to help identify which color the glazing was."

The Mercy Health–West Hospital in Cincinnati, Ohio, used insulated sandwich panels to provide energy efficiency and span from column to column. Courtesy of Nathan Cox.

During the manufacturing process, placing the thin-brick colors in the proper location, as well as cutting the glazed brick, required a special saw to avoid chipping the glazing during cutting. "The forms needed to be built on a radius, and the insulation board was ordered in a narrow width so that it could bend around the radius properly," Robinson says.

During transportation and installation, a pre-erection survey helped to reveal any issues related to field embed or cast-in-place concrete prior to panel delivery. "The erector had to be careful not to damage the glazed brick while setting the panels," he says. "Overall, the erection phase went very well."

The project required a high level of quality control and planning, Robinson says. "The glazed brick was put into a kit form for each individual panel. This helped to determine if we had enough glazed brick material and helped to speed up the production process and brick placement."

—William Atkinson