

Tilt-up goes sky high

Soaring to a record height of more than 91 feet, two tilt-up concrete wall panels help a Texas church build an inspiring addition

BY ROY L. EDGAR

When Gloria Dei Lutheran Church, Nassau Bay, Texas, decided to add an office and worship center several years ago, the architect for the addition wanted to create a distinctive front façade that would be noticed from a distance. Thanks to a design that incorporates two 91-foot, 7¼-inch-tall tilt-up concrete walls, the church can now be seen from miles around. Serving as a frame for the church's new 117-foot cross, the tilt-up panels are the tallest ever erected.

Because working space on the jobsite was at a premium, the twin 10-inch-thick panels were stack-cast, one on top of the other, on a thin casting bed in the narrow front lawn of the church (Fig. 1). Panel width



Standing at a height of 91 feet, 7¼ inches at their peak, these towering tilt-up panels now frame Gloria Dei Lutheran Church's new 117-foot-tall cross.



Figure 1. The two 10-inch-thick panels were stack-cast, one on top of the other, on a thin casting bed in the narrow front lawn of the church. A plywood frame was used as part of the casting surface for the second panel to accommodate the top slope. The two stiff backs attached to the panel kept it from cracking during erection.

All photos courtesy of Dayton Superior Corp.



Figure 2. Each panel had 8 high by 2 wide (16-point) rigging to accommodate bending stresses produced by lifting.

is 17 feet, 5 inches. Though standard procedures were used to form and cast the panels, their enormous size and heft called for carefully engineered rigging and bracing. Each panel weighed 163,300 pounds and required approximately 41 cubic yards of concrete.

Rigging and bracing requirements

All rigging and bracing hardware for the panels was engineered and manufactured by Dayton Superior Corp. An 8 high by 2 wide 16-point rigging was needed to accommodate the bending stresses produced during panel erection (Fig. 2). Even with this generous rigging setup, two sets of double C12x20.7 structural steel-channel stiff backs were required to keep the panels from cracking as they were lifted. Because each panel has a top that slopes nearly 38 feet,

one stiff back was 82 feet long and the other, 70 feet long.

Several months before the panels were cast, a Dayton Superior dealer met with the general contractor and tilt-up erector to plan panel bracing requirements. Dayton Superior engineers determined that the first panel to be lifted would need seven 62-foot-long main braces. Each brace was made up of three 20-foot-long heavy-duty steel pipe braces joined by two connectors. Because of their length, the main braces required knee bracing at two locations,

and the longest knee brace—at 33 feet, 8 inches—required knee bracing as well (Fig. 3). Lateral bracing consisted of 1½-inch-diameter pipe connected with swivel couplers to the knee braces.

Because the panel had to be braced from outside the building, the bottom ends of the braces could not be secured to the floor slab. Therefore, two deadmen were installed—one for securing the ends of the main braces and the other for securing the ends of the longest knee braces. End bracing was accomplished by running ¾-inch-diameter cable from the braces to the

building's structural frame on one side and to the casting slab on the other.

Panel erection

To lift the massive panels, the tilt-up erector used a 650-ton crane with a 148-foot boom. Eight semitrailers and tractors were needed to haul the 309,000-pound counterweight required.


After the first panel was tilted into position and safely braced, the second panel was erected and held in



Figure 3. Extensive bracing was needed to support each panel. The seven 62-foot-long main braces had knee bracing at two locations. And even the longest knee brace required bracing.

position by the crane while workers installed structural steel that tied the two panels together and to the addition's main structural frame.

Although each wall panel was tilted up in only 15 minutes, an hour and a half was required for installation of each main brace and its supporting knee, lateral and end bracing. While one man operated the crane, two men working from a manlift attached the main braces to the first panel, and two men on the ground attached the ends of the braces to the deadmen and installed the knee, lateral and end bracing. To make sure that all the components of the bracing system were installed correctly, two supervisors were on hand to oversee the entire operation.

The church addition, which was completed last month, took almost two years to build. However, tilt-up wall construction—from building the forms to panel erection—took only two weeks. After the panels were erected, they were clad with a brick facing that matches the architecture of the existing church structure. 

Credits

Owner: Gloria Dei Lutheran Church, Nassau Bay, Texas

Architect: Ray and Hollington Architects, Houston

Structural engineer: H.L. Gaddy and Associates Inc., Houston

General contractor: Gamma Construction Co., Houston

Tilt-up erector: Rayko Erectors, The Woodlands, Texas

Tilt-up hardware manufacturer: Dayton Superior Corp., Miamisburg, Ohio

Tilt-up hardware dealer: Shepler's, Houston

Crane supplier: Phillips Crane and Rigging Co., Houston

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