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FEATURES

A Century of Tilt-up

By Concrete Construction Staff



If this photo looks closer to 100 years old than 50, that's because it is. In the early 1900s, crews cast tilt-up panels on a horizontal platform and tilted the wall and platform with screw jacks (historical photo published in May 1991).



Efforts to construct small farm buildings economically produced a technique using a 2-inch pipe pyramidal frame, with the point of hitch 10 feet above the panel face. The frame is attached to the panel at all four points, and a strong cable connects the hitch point to a tractor for lifting (March 1958).

Tilt-up was born in the early 1900s, when architect-contractor Robert Aiken built several buildings in the Midwest. Wall panels were cast on a framed tilt-table, face up so precast architectural elements could be attached. The entire assembly was tilted up with jack screws. Once vertical, the concrete panel was braced and the tilt-table was stripped, lowered, and prepared for the next panel. The concept languished, however, during the Great Depression of the 1930s, when most construction was publicly funded and labor-saving methods were not a priority.

The post-World War II construction boom, coupled with a shortage of skilled labor, created a demand for more efficient methods. The advent of high-capacity mobile cranes, portable welding machines, and ready-mix trucks enabled contractors to erect tilt-up buildings quickly. Thus the tilt-up market was gaining momentum when Concrete Construction was launched in 1956.

During the 1950s and 1960s, manufacturers developed accessories specifically for tilt-up construction, such as custom lifting devices, temporary braces, and chemical bond breakers. In the early 1970s, engineers began developing designs to use tilt-up concrete walls as load-bearing structural elements. The proliferation of microcomputers enabled more sophisticated architectural treatments and complex panel shapes.

At Home in Tilt-up

While simple, low-rise commercial buildings have remained a market staple over the decades, tilt-up contractors have made inroads into residential and multistory applications. In addition, various decorative techniques have made the plain tilt-up box unrecognizable.

The February 1963 issue featured luxury 3600-square-foot tilt-up houses in California. The cost



Perhaps the first multistory tilt-up structure, this Chicago factory was erected in 1912 (historical photo published in September 1968).



Instead of the rock-faced exterior shown here, the builder can use form liners to create walls that

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per square foot was \$11, about 25% lower than a typical custom home in the area. The exterior walls featured native stones hand set into the panels in prearranged patterns.

look like brick, stucco, or wood (February 1992).

At the other end of the spectrum, a May 1970 article covered the use of tilt-up in low-cost concrete homes that could be built and sold as a shell for as little as \$4,000 apiece. The outside wall units were 8 feet high, 46 inches wide, and 6 inches thick. The panels consisted of 2 inches of concrete as an inside layer, 2 inches of rigid polystyrene foam in the center, and 2 inches of white concrete finished with 1-inch green stones.

Tilt-up on the Rise



Empirical design formulas developed in the early 1970s, along with the availability of microcomputers and software for sophisticated analysis of panel lifting stresses, soon led to the routine use of panels three and four stories high with large openings for windows. These trends opened a new market for tilt-up, according to a May 1988 report.

However, the ancestor of these multistory buildings was detailed in a September 1968 article on a tilt-up factory built in Chicago in 1912. The four-story walls were laid out horizontally on a platform resting on steel jacks. The wall forms were filled with concrete and left to set for 48 hours. The walls consisted of 12- and 16-inch curtain walls between 16-inch pilasters spaced on 16-foot centers. It took 8 hours to raise the slabs using 9-foot screws driven by a continuous shaft powered by a 5-hp steam engine.



A fire in a 16-year-old tilt-up building destroyed the plywood roof, but left the walls standing, proving tilt-up can withstand a fire. Here, two collapsed girders lean on the still-standing wall panels (photo March 1991).

A July 80 article covered a new development: the use of post-tensioning to overcome lifting stresses in tilt-up panels. This technique enabled contractors to erect tall, intricate architectural panels without using conventional

strongbacks.

The Decorative Front

Early panel designs were utilitarian, but over the years tilt-up construction moved upscale with a wide range of architectural treatments. Of the 272 million square feet of tilt-up wall surface constructed in 2001, 15% to 20% used decorative techniques.



EIFS adds relief and color to tilt-up panels. On this building, EIFS is used to construct the white columns and the wall surfaces on the circular structure.

A January 1966 article described the use of exposed-aggregate panels that cost only 10 cents more per square foot than a plain-troweled concrete tilt-up wall. The October 1971 issue reported on new casting techniques allowing the fabrication of large numbers of panels offering more textures and colors than could be precast in a plant or placed by a stone mason.

A March 1991 article featured a project that used trompe l'oeil ("fool the eye") painting techniques to create the illusion of relief on the building façade. More recently, real detail and depth have been added using exterior insulation and finish systems (EIFS), as explained in a June 2002 report. Shapes such as columns and cornices are made from polystyrene foam and bonded to the concrete walls, polymer cement is applied with plastic netting as reinforcement,

and colored polymer-cement finish coats are applied.



Real or trompe l'oeil? The masonry, arches, columns, roof tiles, turrets, and boulders at the base of the wall are all painted onto the tilt-up panels (March 1991).



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