

# Tilt-Up Concrete Construction Guide

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*Tilt-up concrete construction is commonly used in low-rise building construction. This guide discusses many of the issues relating to the planning and construction of these buildings to produce a quality tilt-up project. Major topics include preconstruction planning, foundations, special considerations for slab-on-ground construction, wall panel forming and casting, panel erection, connections and repairing, and painting.*

**Keywords:** finish; insert; panel; release agent; sandwich panel; tilt-up.

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## CHAPTER 1—PREFACE

### 1.1—Introduction

According to ACI 116R, “Tilt-up construction is a technique for casting concrete elements in a horizontal position at the jobsite and tilting them to their final position in the structure,” while ACI 318 and IBC 2000 establish “a structural concrete element cast elsewhere than its final position in the structure.” ACI 318 further states that tilt-up concrete construction is a form of precast concrete. Several features make the tilt-up construction method unique. Tilt-up panels are generally handled only once. They are lifted or tilted from the casting slab and erected in their final position in one, continuous operation. Tilt-up panels are generally of such large size and weight that they can only be constructed on site and in close proximity to their final location in the structure. Panel gravity loads are supported directly by the foundation

instead of being supported by a structural frame. Typically, tilt-up panels are erected before the structural frame. Tilt-up panels are usually load-bearing for gravity loads and lateral loads. In fact, a whole industry developed around the tilt-up construction method. Tilt-up concrete construction is a unique form of site-cast precast construction and, as such, has its own specialized set of design parameters and construction techniques.

This guide is not all-inclusive; it presents basic concepts, techniques, and procedures involved in tilt-up construction. The design of tilt-up wall panels is not addressed in this guide, although it is stressed that both designers and contractors can benefit from the contents. This guide includes a brief history of tilt-up concrete and a discussion of planning; foundation and floor slab construction; and wall panel forming, casting, and erection. It briefly describes typical connections used to attach the panels to the rest of the structure, and options for panel finishes are briefly described.

### 1.2—History of tilt-up construction

Precasting building elements is not a new idea, as stated in the *Manual of Tilt-Up Construction*, (Collins 1955). Villagers in Jarmo, Iraq, made walls for their dwellings from “Touf,” a pressed mud, as early as 4700 B.C. As cementitious materials became available, the quality and durability of these precast materials improved. The Romans produced pozzolan cement, which they used extensively in their building projects, but it was not until the nineteenth century and the development of portland cement that concrete structures became integral to the construction process. By 1890, portland cement was widely accepted as the standard cementing material.

Early structures using portland-cement concrete were usually cast-in-place. By 1914, cast-in-place concrete reinforced with mild steel reinforcing bars was second only to structural steel as a building material.

Some builders in the United States developed an early form of tilt-up construction in which a tilting platform was used. Robert Aiken, in *Monolithic Concrete Wall Building—Methods, Construction and Cost* (Aiken 1909), described the innovative method where walls for the building were constructed on a structural platform, then rotated or tilted upward by means of specially designed mechanical jacks, setting the panel in its final position. This “tilt table” method was used on the Jewett Lumber Company in Des Moines, Iowa, between 1906 and 1912, and on several Army facilities, factory buildings, and churches. The tilt table method was also used on the Zion Methodist Church in suburban Chicago. The church construction incorporated decorative precast elements that were embedded in the tilt-up panels (Fig. 1.1 and 1.2).

Collins stated that railroads, during the period before World War I, developed a technique for precasting large sections of bridges from reinforced concrete and setting them in place with their heavy cranes (Collins 1958). The cranes, however, were mounted on railroad cars and required additional track to be laid to access the site.

The idea of precasting large structural units using reinforced concrete cast into molds or forms was hastened by World