

ACI 533R-11

**Guide for Precast
Concrete Wall Panels**

Reported by ACI Committee 533



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Guide for Precast Concrete Wall Panels

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This guide presents recommendations for precast concrete wall panels. It should be used with ACI 318-08, "Building Code Requirements for Structural Reinforced Concrete," which is legally binding when adopted by the local authority. This guide discusses the basic principles of design, tolerances, materials, fabrication, installation, quality requirements, and testing.

Keywords: admixtures; aggregates; architectural concrete; coatings; cracking (fracturing); curing; deflection; design; drying shrinkage; fabrication; formwork; inspection; installation joints (junction); precast concrete panels; repairs; sandwich panels; sealants; structural design; surface defects; tolerances; volume change.

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Reference to this document shall not be made in contract documents. If items found in this document are desired by the Architect/Engineer to be a part of the contract documents, they shall be restated in mandatory language for incorporation by the Architect/Engineer.

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CHAPTER 1—GENERAL CONSIDERATIONS

1.1—Introduction

The widespread popularity of concrete as a building material can be attributed to the availability, favorable properties, and geographic distribution of its naturally-occurring mineral constituents. Concrete is easily formed and molded, comparatively economical, and durable in its finished state. Architectural precast panel use has increased because of the nature of concrete as a material and the fact that prefabricated components add to construction efficiency. By exposing decorative aggregates, using veneer facing materials, and by varying sizes, shapes, and textures of panels, the engineer/architect can respond creatively to client needs.

1.2—Scope

This document provides guidelines for specifying, planning, designing, fabrication, and erecting precast concrete wall panels. Although the focus is on precast wall panels produced in established precasting plants, site precasting is an option that has been used successfully. Tilt-up concrete, as discussed in ACI 551.1R-05, is a variation of site precasting. ACI 533R should aid in establishing and maintaining quality

site fabrication as well as plant fabrication of precast wall panels.

This guide covers non-load-bearing or load-bearing panels, fabricated of normal or lightweight concrete. Panels may be one of the following types:

- Solid
- Insulated (sandwich)
- Ribbed
- Hollow-core
- Sculptured

In addition to reinforced panels, lightly prestressed (effective prestress, after all losses, between 150 and 225 psi [1.0 and 1.7 MPa]) and prestressed panels are covered. Structural design considerations addressed in Chapter 3 include the use of panels as shear wall components.

Emphasis is placed on wall panels with an integral exposed aggregate concrete surface finish. Smooth wall panels and panels with a textured or shaped architectural surface finish are included. Panels having natural stone veneer or ceramic veneer finishes are not covered in detail.

1.3—Responsibility

1.3.1 General—Contractual agreements should assign responsibilities to avoid disagreements on basic definitions and decisions originating from the specifying agency. A special report of an ad hoc committee for the responsibility for design of precast concrete structures was published by the Precast/Prestressed Concrete Institute (PCI 1988) and recommends assignment of authority and responsibility for design and construction of precast concrete structures.

This guide covers the design of panels by an engineer/architect. ACI Committee 533 presents supplemental design guidelines that are special to precast concrete wall panels and should be used with ACI 318-08. ACI 318-08 provides minimum design requirements and is legally binding when adopted by the local authority.

Overlapping responsibilities for the structural design of wall panels may introduce conflicts between the engineer/architect and general contractor regarding contract document review, design for handling, installation stresses, in-place loads, and adequacy of connections. It is essential that work assignments and responsibilities be clearly defined in the contractual arrangements.

1.3.2 Structural design—The engineer/architect can benefit from preconstruction contact with panel producers. Handling and installation procedures vary widely, and guidelines for these operations should correspond with local practices but be consistent with Chapter 3 of this guide. Most precasters maintain an engineering staff to prepare contract documents and the engineer/architect should interact with this group to obtain constructive advice and suggestions concerning local practice, fabrication details, and fabrication capabilities. When possible, this discussion should take place during the initial design phases of a construction project. Once a job is released for bidding and the structural concepts have been established, changes may be difficult to implement.