

**ACI 362.1R-12**

**Guide for the Design and  
Construction of Durable Concrete  
Parking Structures**

Reported by ACI Committee 362



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## **Guide for the Design and Construction of Durable Concrete Parking Structures**

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# Guide for the Design and Construction of Durable Concrete Parking Structures

Reported by ACI Committee 362

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*This guide presents design and construction criteria used to improve the durability of concrete parking structures. Emphasis is placed on key design criteria unique to parking structures, including structural systems, materials, structural design, durability, and construction. Also covered are cast-in-place nonprestressed concrete, cast-in-place post-tensioned concrete, and precast/prestressed concrete structural systems for use in parking structures.*

**Keywords:** concrete durability; construction; corrosion; curing; finishes; freezing-and-thawing resistance; nonprestressed reinforcement; parking structures; post-tensioning; precast concrete; prestressed concrete.

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This guide addresses the design and construction of durable concrete parking structures.

Parking structures are different from other concrete buildings due to their:

- a) Reduced roofing, cladding, and climate control that result in a more severe direct or indirect exposure to rain, snow, sunlight, temperature variations, and airborne chlorides
- b) Vehicular occupancy that imposes heavy moving loads and deposits deicing salts
- c) Ramps between floors for vehicular circulation and enhanced drainage that present unique structural challenges
- d) Large plan size that magnifies the potential for damage caused by restraint of movements and forces associated with volumetric changes

All are factors that influence the durability of parking structures and require consideration in their design. Maintenance of parking structures is essential to durability and longevity. For more information, refer to ACI 362.2R-00.

**1.2—Scope**

The purpose of this guide is to provide specific information on several of the design aspects and the construction

of parking structures that differentiates them from other concrete structures. This guide should be used with ACI 318-11, ACI specifications, and ACI standards.

Environmental conditions of the geographic location of a parking structure determine the governing criteria used in this guide. Environmental conditions include structure proximity to sea water and frequency of exposure to direct and indirect applications of deicing salts and freezing temperatures. Once the appropriate environmental conditions are determined, this guide provides the necessary durability criteria for parking structure design and construction. Parking structures integrally constructed with surrounding earth-retaining walls or other restraining structures require additional analysis of the restraining forces and lateral soil loads.

**CHAPTER 2—DEFINITIONS**

ACI provides a comprehensive list of definitions through an online resource, “ACI Concrete Terminology” (<http://terminology.concrete.org>). Definitions provided herein complement that resource.

**corrosion inhibitor**—a chemical compound, either liquid or powder, usually intermixed in concrete and sometimes applied to concrete, and that effectively decreases corrosion of steel reinforcement.

**deicer**—chemical, such as sodium or calcium chloride, used to melt ice or snow on slabs and pavements by lowering the freezing point.

**guardrail, pedestrian**—element at the edge of an open-sided walking surface, intended to restrain a pedestrian from falling from the structure to an adjacent lower surface.

**guardrail, vehicle**—element at the edge of the driving and parking surface, intended to restrain a vehicle from falling from the structure to an adjacent lower surface.

**membrane, traffic-bearing**—an elastomeric coating capable of withstanding vehicular traffic.

**pour strip**—a defined zone of concrete placed after and used to temporarily separate adjoining parts of the structure that have been constructed.

**pretopped**—plant-manufactured, precast, prestressed concrete floor or roof members that do not require a field-placed concrete topping.

**tooled joint**—a groove tooled into fresh concrete using a concrete jointer tool to create a weakened plane intended to control the location of cracks.

**CHAPTER 3—STRUCTURAL SYSTEMS****3.1—General**

Structural concrete is an ideal material to meet the demands of parking structure construction and maintenance. It is specifically recognized by the International Code Council (ICC) (2009 ICC International Building Code) as an appropriate noncombustible material for parking garage construction. In addition to proper design and construction, a disciplined long-term preventive maintenance program is required from the time a parking structure begins operation to ensure the structure will meet service life goals.