**ACI 322M-10**

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# Residential Code Requirements for Structural Concrete (ACI 332M-10) and Commentary

An ACI Standard

Reported by ACI Committee 332

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# Residential Code Requirements for Structural Concrete and Commentary



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*The "Residential Code Requirements for Structural Concrete" cover the design and construction of cast-in-place concrete for one- and two-family dwellings and multiple single-family dwellings (townhouses), and their accessory structures.*

*Among the subjects covered are the design and construction requirements for plain and reinforced concrete footings, foundation walls, and slabs-on-ground, and requirements for concrete, reinforcement, forms, and other related materials.*

*The quality and testing of materials discussed in this document are covered by reference to the appropriate ASTM standards.*

*The Code is written to allow for reference by adoption in a general building code without changing its language. Background details or suggestions for carrying out the requirements or intent of the Code are provided in the commentary. The commentary discusses some of the considerations of the committee in developing the Code with emphasis given to the explanation of provisions that may be unfamiliar to code users or where significant departure exists from other concrete codes. Commentary provisions begin with an "R," such as "R.1.1.1," and commentary text is shown in italics.*

*Relevant resource documents are cited for the user desiring more detailed study of individual issues.*



**Keywords:** admixtures; aggregates; air entrainment; anchorage (structural); backfill; building codes; calcium chloride; cements; cold weather construction; compressive strength; concrete construction; concrete construction joints; concretes; contraction joints; cover; curing; flexural strength; floors; footings; formwork (construction); foundation walls; foundations; hot weather construction; inspection; loads (forces); materials; mixing; mixture proportioning; placing; plain concrete; reinforced concrete; reinforcing steels; residential; serviceability; specifications; slab-on-ground; slabs; sulfates exposure; strength; structural analysis; structural concrete; structural design; walls; water; welded wire reinforcement.


## CONTENTS




ACI 332M-10 supersedes 332-08, became effective May 18, 2010, and was published August 2010.

## INTRODUCTION

The commentary of ACI 332M-10 discusses some of the considerations of Committee 332 in developing the provisions contained in "Residential Code Requirements for Structural Concrete (ACI 332M-10)," hereinafter called the "Code." Explanation of the departure of this Code from ACI 318M is emphasized. Comments on specific provisions are made under the corresponding chapter and section numbers of the Code.

The commentary is not intended to provide a complete historical background concerning the development of the Code, nor is it intended to provide a detailed résumé of the studies and research data reviewed by the committee in formulating the Code.

However, references to some research data are provided for those who wish to study the background material in depth. The Code is meant to be used as part of a legally adopted building code and, as such, must differ in form and substance from documents that provide detailed specifications, recommended practice, or complete design procedures.

The Code is intended to cover all residential structures that fall within the scope of the International Residential Code (IRC). Requirements more stringent than the Code provisions may be desirable for large, complex or irregular structures, high-hazard areas, and other unusual construction. The Code and commentary cannot replace sound engineering knowledge, experience, and judgment.

A building code states only the minimum requirements necessary to provide for public health and safety. The Code is based on this principle. For any structure, the owner or the designer may require the quality of materials and construction to be higher than the minimum requirements necessary to protect the public as stated in the Code. However, lower standards are not permitted. The commentary directs attention to other documents that provide suggestions for carrying out the requirements and intent of the Code. However, those documents and the commentary are not a part of the Code.

The Code has no legal status unless adopted by government bodies having authority to regulate building design and construction. Where the Code has not been adopted, it may serve as a reference to good practice even though it has no legal status.

The Code provides a means of establishing minimum standards for acceptance of designs and construction by legally appointed building officials or their designated representatives. The Code and commentary are not intended for use in settling disputes between the owner, engineer, architect, contractor, or their agents, subcontractors, material suppliers, or testing agencies. Therefore, the Code cannot define the contract responsibility of each of the parties in construction. General references requiring compliance with the Code in the project specifications should be avoided because the contractor is rarely in a position to accept responsibility for design details or construction requirements that depend on detailed knowledge of the design. Design-build construction contractors, however, typically combine the design and construction responsibility. Generally, the drawings, specifications, and contract documents should contain all the necessary requirements to ensure compliance with the Code. In part, this can be accomplished by reference to specific Code sections in the project specifications. Other ACI publications, such as ACI 301M, are written specifically for use as contract documents for construction. Testing and certification programs should be provided for the individual parties involved with the execution of work performed in accordance with this Code.

ACI 332.1R is a companion document to the Code that provides practical information about the quality construction of residential concrete elements conforming to this Code. ACI 332.1R provides detailed information on systems for production, placement, finishing, and testing residential concrete along with considerations for such issues as insulation, hot and cold weather precautions, curing, and forming. ACI 332.1R does not provide any further mandatory requirements

but suggests ways of working within the scope of the Code to deliver the highest quality residential concrete.

## CHAPTER 1—GENERAL

### 1.1—Scope

**1.1.1** This Code, when legally adopted as part of a general building code, provides minimum requirements for design and construction of residential concrete elements. In areas without a legally adopted building code, this Code defines minimum acceptable standards of design and construction practice.

***R1.1.1*** *The user of this Code should consult the applicable general building code for all applied loads to determine the applicable values for design requirements. In the absence of a governing code, the user should consider the use of ASCE/SEI 7 to determine applicable loads.*

**1.1.2** This Code supplements the general building code and governs matters pertaining to design and construction of cast-in-place concrete construction for one- and two-family dwellings and multiple single-family dwellings (townhouses), and their accessory structures, except wherever this Code conflicts with requirements in the legally adopted general building code.

**1.1.3** Where this Code conflicts with requirements contained in other standards referenced in this Code, this Code shall govern.

***R1.1.3*** *The IRC references this Code. Where the design of an element is initiated with this Code from reference by the IRC, the entire design of the element must be completed using the provisions of this Code.*

**1.1.4** This Code is limited to design and construction of concrete footings, including thickened slab footings, wall footings, and isolated footings; concrete basement or foundation walls constructed with removable forms or with flat insulating concrete forms; and concrete slabs-on-ground.

***R1.1.4*** *The design and construction requirements for footings, foundation walls, and slabs-on-ground are included in this Code, together with requirements for concrete, reinforcement, forms, and other related materials.*

**1.1.5** Where the scope of this Code and the scope of ACI 318M coincide, design in accordance with ACI 318M shall be permitted for all buildings and structures, and all parts thereof, within the scope of this Code.

**1.1.6** This Code does not govern design and construction of insulating concrete form walls with a waffle or screen configuration; precast wall elements; above-grade concrete walls; deep foundation systems, such as piles, drilled piers, or caissons; and elevated concrete slabs.

***R1.1.6*** *Provisions for application of precast wall elements are found in the International Residential Code (IRC) and other publications. The provisions for above-grade concrete walls are currently available in the 2009 IRC based on the PCA 100 Standard or directly found in the PCA 100 Standard.*

**1.1.7** This Code does not govern the design and application of systems for surface drainage, waterproofing, dampproofing, and the ventilation of radon gases.

***R1.1.7*** *Guidance on the type and application of systems for drainage, waterproofing, dampproofing, and radon gas ventilation are commonly found in the general building code.*

**1.1.8** When a building or structure contains elements that exceed the limits of this Code or otherwise do not conform to this Code, these elements shall be designed in accordance with ACI 318M.

**1.1.9** Where permitted by the statutes of the jurisdiction where the project is to be constructed, construction documents for residences designed by the provisions of this Code need not be prepared by a Licensed Design Professional. Where required by the statutes of the jurisdiction where the project is to be constructed, a Licensed Design Professional shall prepare the construction documents for residences.

**1.1.10** The Code is intended to state only minimum requirements necessary to provide for public health and safety for the design of residences that fall within the scope of the International Residential Code (IRC). The owner or the Licensed Design Professional may require the quality of materials and construction to be higher than the minimum requirements stated in the Code.

**1.1.11** The Code is not intended to define contractual responsibilities between all the parties involved in a project, nor is the Code intended to settle disputes regarding contractual responsibilities.

**1.1.12** The commentary text, tables, figures, or illustrations shall not be used to interpret the Code in a way that conflicts with the plain meaning of the Code text, or to create ambiguity within the Code that would not otherwise exist.

**1.1.13** The English version in U.S. customary units is the official version of the Code. In case of conflict between the official version and versions with SI units or in different languages, the official version governs.

### 1.2—Alternative systems

Sponsors of any system of design or construction or an alternative material to be applied within the scope of this Code, the adequacy of which has been shown by successful use or by analysis or test, but which does not conform to or is not covered by this Code, shall have the right to present the data on which their design is based to the building official or to a board of examiners appointed by the building official. This board shall have authority to investigate the data so submitted, to require tests, and to formulate rules governing design and construction of such systems to meet the intent of this Code. These rules, if approved by the building official and promulgated, shall be of the same force and effect as the provisions of this Code.

***R1.2*** *New methods of design, new materials, and new uses of materials should undergo a period of development before being specifically covered in a code. Hence, good systems or components might be excluded from use by implication if means were not available to obtain acceptance. For systems considered under this section, specific tests, load factors, deflection limits, and other pertinent requirements should be set by the board of examiners, and should be consistent with the intent of this document.*