

An ACI Standard

# Requirements for Reinforced Concrete Chimneys— Code and Commentary

Reported by ACI Committee 307

ACI CODE-307-23



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## Requirements for Reinforced Concrete Chimneys—Code and Commentary

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# Requirements for Reinforced Concrete Chimneys— Code and Commentary

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Reported by ACI Committee 307

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*This Code provides material, design, and detailing requirements for cast-in-place and precast reinforced concrete chimneys. It sets forth minimum loadings for design and contains methods for determining the concrete and reinforcement required to obtain the strength required by the loadings. The methods of analysis apply primarily to circular chimney walls, but guidance is included for applying the general principles to noncircular chimney walls.*

**Keywords:** across-wind load; construction requirements; earthquake load; flexural strength; load combinations; reinforced concrete; reinforced concrete chimneys; structural design; thermal load; vortex shedding; windload.

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**PREFACE**

ACI CODE-307 is based on ACI 318-19 and ASCE/SEI 7-16. Updated requirements in ACI 318 and ASCE/SEI 7, as well as recent studies and research, have resulted in the following revisions of this Code:

- (a) The Code has been reorganized to follow the current ACI 318 format as much as possible.
- (b) Wind loads are based on a strength-level wind speed.
- (c) The damping ratio at the strength-level wind speed for the across-wind load has been decreased from 4% to 2.5%.

(d) Seismic loading and detailing are consistent with ASCE/SEI 7.

(e) Foundation requirements are expanded and revised. Refer to Appendix F for a more comprehensive list of changes.

This Code was developed by an ANSI-approved consensus process. This Code can supplement a current (ICC) building code, supplement the codes governing new and existing structures of a local jurisdiction authority, or act as a stand-alone code in a locality that has not adopted an existing building code.



## CODE

## CHAPTER 1—GENERAL

**1.1—Scope**

**1.1.1** ACI 307 includes provisions for the structural design of nonprestressed cast-in-place and nonprestressed precast reinforced concrete chimneys.

**1.2—General**

**1.2.1** ACI 307, “Requirements for Reinforced Concrete Chimneys—Code and Commentary,” is hereafter referred to as “this Code.”

**1.2.2** In this Code, the general building code refers to the building code adopted in a jurisdiction. When adopted, this Code forms part of the general building code.

**1.2.3** This Code provides minimum requirements for the materials, design, construction, and strength evaluation of cast-in-place or nonprestressed precast reinforced concrete chimneys designed and constructed under the requirements of the general building code.

**1.2.4** Modifications to this Code that are adopted by a particular jurisdiction are part of the laws of that jurisdiction but are not a part of this Code.

**1.2.5** If no general building code is adopted, this Code provides minimum requirements for the materials, design, construction, and strength evaluation of any reinforced concrete chimney within the scope of this Code.

**1.3—Purpose**

**1.3.1** The purpose of this Code is to provide for public health and safety by establishing minimum requirements for strength, stability, serviceability, and durability of reinforced concrete chimneys.

**1.3.2** This Code does not address all design considerations.

## COMMENTARY

## CHAPTER R1—GENERAL

**R1.1—Scope**

**R1.1.1** The provisions apply to circular and noncircular reinforced concrete chimneys.

A precast reinforced concrete chimney is defined as a chimney constructed from precast reinforced concrete sections (360-degree sections only, which may include openings), assembled one on top of another, to form a self-supporting cantilevered structure. Vertical reinforcement and grout are placed in cores as the precast sections are erected to provide structural continuity and stability during construction and for the completed structure. The design of precast concrete chimneys incorporating post-tensioning of the segments is beyond the scope of this Code.

**R1.2—General**

**R1.2.5** This Code applies to reinforced concrete chimneys having circular or noncircular cross sections.

This Code provides minimum requirements and exceeding these minimum requirements is not a violation of this Code. The licensed design professional is permitted to specify project requirements that exceed the minimum requirements of this Code.

**R1.3—Purpose**

**R1.3.1** This Code provides a means of establishing minimum requirements for the design and construction of reinforced concrete chimneys as well as for acceptance of the design and construction of reinforced concrete chimneys by the building officials or their designated representatives.

**R1.3.2** The minimum requirements in this Code do not replace professional judgment or the licensed design professional’s knowledge of the specific factors surrounding a project, including its design, the project site, and other specific or unusual circumstances related to the project.

## CODE

### 1.4—Applicability

**1.4.1** This Code applies to circular and noncircular cast-in-place or precast reinforced concrete chimneys designed and constructed under the requirements of the general building code.

**1.4.2** If noncircular shapes are used, their design shall be substantiated in accordance with the principles of this Code and, where applicable, in accordance with **ACI 318**.

**1.4.3** This Code does not apply to the design and construction of a chimney liner or lining. The effects of the liner or lining shall be considered when determining the loads to be resisted by the concrete chimney structure.

### 1.5—Interpretation

**1.5.1** The official version of this Code is the English language version using inch-pound units published by the American Concrete Institute.

**1.5.2** In case of conflict between the official version of this Code and other versions of this Code, the official version governs.

**1.5.3** This Code consists of chapters, including text, headings, figures, footnotes to figures, and referenced standards.

**1.5.4** The Commentary consists of a preface, commentary text, figures, and cited publications. The Commentary is intended to provide contextual information but is not part of this Code, does not provide binding requirements, and shall not be used to create a conflict with or ambiguity in this Code.

**1.5.5** Appendixes are not part of this Code.

**1.5.6** This Code shall be interpreted in a manner that harmonizes and avoids conflict between or among its provisions. Specific provisions shall govern over general provisions.

**1.5.7** This Code shall be interpreted and applied in accordance with the plain meaning of the words and terms used. Specific definitions of words and terms in this Code shall be used where provided and applicable, regardless of whether

## COMMENTARY

### R1.4—Applicability

**R1.4.1** Design equations in this Code have been developed for reinforced concrete chimneys having a circular cross section.

**R1.4.2** Due to the many possible configurations of noncircular cross sections, it is not possible to develop specific procedures for every design situation. However, the general principles of this Code and ACI 318 may be applied to the design of reinforced concrete chimneys having a noncircular cross section.

**R1.4.3** Vertical (gravity) load will be affected by how the weight of a liner or lining is vertically supported. Wind load and seismic load will be affected by how a liner or lining is laterally and vertically supported by the concrete chimney due to the effects on the chimney's natural frequencies (refer to **7.1.3**). Thermal load will be affected by the insulating properties of a liner or lining. Typically, the chimney is designed considering the wind and seismic loads both with and without the effects of a liner or lining (refer to **R4.3.1** and **R7.2.2**).

### R1.5—Interpretation

**R1.5.3** Appendixes illustrate acceptable methods for determining some parameters of this Code. The methods illustrated are not necessarily the only acceptable methods.

**R1.5.7** This Code addresses numerous requirements that can be implemented fully without modification if other requirements in this Code are determined to be invalid. This severability requirement is intended to preserve this Code and