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An ACI and PCI Standard

Structural Precast Concrete—Code Requirements and Commentary

Reported by Joint ACI-PCI Committee 319

ACI/PCI CODE-319-25

American Concrete Institute
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Precast/Prestressed Concrete Institute

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An ACI/PCI Standard

Reported by Joint ACI-PCI Committee 319

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PREFACE TO ACI/PCI CODE-319-25

The "Structural Precast Concrete—Code Requirements and Commentary" ("Code") provides minimum requirements for the materials, design, and detailing of structural precast concrete buildings and, where applicable, nonbuilding structures. This Code was developed using a consensus process and addresses plant-produced and site-produced structural precast concrete that contains nonprestressed reinforcement or pretensioned reinforcement, or both. The Design Standard Committee of Precast/Prestressed Concrete Institute was instrumental in the development of code provisions and commentary for this Code and whose efforts are gratefully acknowledged. Among the subjects covered are: design and construction for strength, serviceability, and durability; load combinations, load factors, and strength reduction factors; structural analysis methods; deflection limits; mechanical and adhesive anchoring to concrete; development and splicing of reinforcement; construction document information; field inspection and testing; and methods to evaluate the strength of existing structures.

This Code adheres to the chapter and section numbering of ACI CODE-318-25 and either cites or repeats applicable provisions from ACI CODE-318. Provisions that are identical to ACI CODE-318 and are repeated in this Code are denoted with an equal sign ("="). Provisions that are applicable to precast concrete but are not repeated in the Code are denoted as "See ACI CODE-318." Design and detailing requirements for structural systems or for individual members are presented in chapters devoted to those individual subjects, and the chapters are arranged in a manner that generally follows the process and chronology of design and construction. Information and procedures that are common to the design of multiple member types are located in utility chapters. Within chapters, the terms "out of scope" and "not applicable" are used for numbered section headings from ACI CODE-318 that are not covered by this Code, while the term "intentionally left blank" is used as a place holder to maintain consistency with section numbering in situations where ACI CODE-318 includes a numbered provision that is not also in this Code.

Uses of the Code include adoption by reference in a general building code, and it is in a format that allows such reference without change to its language. Therefore, background details or suggestions for carrying out the requirements or intent of the Code provisions cannot be included within the Code itself. The Commentary is provided for this purpose.

Some considerations of the committee in developing the Code are discussed in the Commentary, with emphasis given to the explanation of provisions. Given the similarity in design requirements for structural concrete that is either cast-in-place or precast, the commentary explains the difference in application. The commentary also provides explanations regarding situations where use of both ACI CODE-318 and this Code is necessary. For instance, design of cast-in-place, nonprestressed concrete members or structures requires the use of ACI CODE-318 alone. Design of precast concrete structures requires the use of this Code and ACI CODE-318. Design of precast, post-tensioned concrete structures requires the use of applicable provisions of ACI CODE-318, ACI/PCI CODE-319, and ACI/PTI CODE-320. For provisions that specifically address post-tensioning and are generally not within the scope of precast concrete, this code references either ACI CODE-318 or ACI/PTI CODE-320, as applicable.

Much of the research data referenced in preparing the Code is cited for the user desiring to study individual questions in greater detail. Other documents that provide suggestions for carrying out the requirements of the Code are also cited, including PCI Standards and PCI or Tilt-up Concrete Association (TCA) design manuals, recommended practices, and reports.

KEYWORDS

beam-column frame; beams (supports); columns (supports); combined stress; composite construction (concrete to concrete); compressive strength; concrete; construction documents; construction joints; continuity (structural); contraction joints; cover; deep beams; deflections; earthquake-resistant structures; flexural strength; floors; inspection; isolation joints; joints (junctions); joists; lightweight concretes; load tests (structural); loads (forces); modulus of elasticity; moments; piles; precast concrete; prestressed concrete; pretensioned concrete; prestressing steels; quality control; reinforced concrete; reinforcing steels; roofs; serviceability; shear strength; spans; splicing; strength analysis; stresses; structural analysis; structural design; structural integrity; structural walls; T-beams; torsion; walls; welded wire reinforcement.

INTRODUCTION

ACI/PCI CODE-319-25, "Structural Precast Concrete—Code Requirements and Commentary," hereinafter called the Code or the 2025 Code, and its "Commentary," are presented in a side-by-side column format. These are two separate but coordinated documents, with Code text placed in the left column and the corresponding Commentary text aligned in the right column. Commentary section numbers are preceded by an "R" to further distinguish them from Code section numbers. The two documents are bound together solely for the user's convenience. Each document carries a separate enforceable and distinct copyright.

As the name implies, "Structural Precast Concrete—Code Requirements and Commentary" 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, complete design procedures, or design aids.

The Code is intended to cover all buildings of the usual types, both large and small. Requirements more stringent than the Code provisions may be desirable for 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 licensed design professional 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 Code has no legal status unless it is adopted by the government bodies having the police power 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 and Commentary are not intended for use in settling disputes between the owner, licensed design professional, specialty 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 precast concrete construction. In structural precast concrete, either all or a portion of the design work is often delegated to the contractor who retains a specialty engineer to perform such design work. The division of responsibility between the engineer-of-record and the specialty engineer must be clearly defined in the contract documents. ACI PRC-132-14 provides guidance to the engineer of record regarding the details needed to address delegated design in the contract documents. 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 a detailed knowledge of the design. Design-build construction contractors, however, typically combine the design and construction responsibility. In structural precast concrete, either all or a portion of the design work is often delegated to the contractor who retains a specialty engineer to perform such design work. Generally, the 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 "Specifications for Structural Concrete" (ACI SPEC-301) are written specifically for use as contract documents for construction.

The Commentary discusses some of the considerations of Committee 319 in citing ACI CODE-318 provisions or in developing new provisions contained in the Code. Emphasis is given to the explanation of provisions that may be unfamiliar to Code users. 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 provisions of the Code. However, references to some of the research data are provided for those who wish to study the background material in depth.

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 Commentary is intended for the use of individuals who are competent to evaluate the significance and limitations of its content and recommendations, and who will accept responsibility for the application of the information it contains. ACI and PCI disclaim any and all responsibility for the stated principles. ACI and PCI shall not be liable for any loss or damage arising therefrom. Reference to the Commentary shall not be made in construction documents. If items found in the Commentary are desired by the licensed design professional to be a part of the contract documents, they shall be restated in mandatory language for incorporation by the licensed design professional.

It is recommended to have the materials, processes, quality control measures, and inspections described in this document tested, monitored, or performed by individuals holding the appropriate ACI and PCI Certification or equivalent, when available. The personnel certification programs of the American Concrete Institute and the Precast/Prestressed Concrete Institute; the plant certification programs of the Precast/Prestressed Concrete Institute, and the Concrete Reinforcing Steel Institute's Voluntary Certification Program for Fusion-Bonded Epoxy Coating Applicator Plants are available for this purpose. In addition, "Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection" (ASTM E329-21) specifies performance requirements for inspection and testing agencies.

CODE

CHAPTER 1—GENERAL

1.1—Scope of ACI/PCI CODE-319

=**1.1.1** This chapter addresses
(a) General requirements of this Code
(b) Purpose of this Code
(c) Applicability of this Code
(d) Interpretation of this Code
(e) Definition and role of the building official and the licensed design professional
(f) Construction documents
(g) Testing and inspection
(h) Approval of special systems of design, construction, or alternative construction materials

1.2—General

1.2.1 ACI/PCI CODE-319, "Building Code Requirements for Structural Precast Concrete," 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 The official version of this Code is the English language version, using inch-pound units, published by the American Concrete Institute and the Precast/Prestressed Concrete Institute.

COMMENTARY

CHAPTER R1—GENERAL

R1.1—Scope of ACI/PCI CODE-319

R1.1.1 The Code includes provisions for the design of precast concrete used for structural purposes, including plain concrete; concrete containing nonprestressed reinforcement, pretensioned reinforcement, or both; and anchoring to concrete. Precast concrete includes plant-produced or site-produced structural precast concrete such as tilt-up construction.

Although fabrication of precast concrete has different procedures than cast-in-place structural concrete, precast concrete structures are designed using many of the same requirements that are included in ACI CODE-318. Because the Code and ACI CODE-318 share many common requirements, the Code was formatted with section numbering that is parallel to that of ACI CODE-318.

For ease of use, provisions for cast-in-place concrete that apply to precast concrete and are identical to ACI CODE-318 are denoted with an equal sign ("="). Provisions that are applicable to precast concrete but are not reproduced in the Code are denoted as "See ACI CODE-318".

Where requirements specific to precast concrete were added to the Code, new sections were created to avoid conflict with ACI CODE-318.

The terms "out of scope" and "not applicable" are used for numbered section headings from ACI CODE-318 that are not covered by the Code, while the term "intentionally left blank" is used as a place holder to maintain consistency with section numbering in situations where ACI CODE-318 includes a numbered provision that is not also in the Code.

Design of precast, post-tensioned concrete structures requires the use of applicable provisions of ACI/PCI CODE-319, ACI/PTI CODE-320, and ACI CODE-318. For provisions that specifically address post-tensioning and are generally not within the scope of precast concrete, the Code references either ACI CODE-318 or ACI/PTI CODE-320, as applicable.

This chapter includes numerous provisions that explain where the Code applies and how it is to be interpreted.

R1.2—General

R1.2.1 The commentary refers to ACI/PCI CODE-319 as "the Code."

R1.2.2 The American Concrete Institute and the Precast/Prestressed Concrete Institute recommend that the Code be adopted in its entirety.

R1.2.3 ACI-PCI Committee 319 develops the Code in English, using inch-pound units. Two translations are published by ACI:

(a) In English using SI units (ACI/PCI CODE-319-25, "Structural Precast Concrete—Code Requirements and Commentary (SI)").

CODE	COMMENTARY
	(b) In Spanish using SI units (ACI/PCI CODE-319-25, "Concreto estructural prefabricado—Requisitos del código y Commentario").
="**1.2.4** In case of conflict between the official version of this Code and other versions of this Code, the official version governs.	
1.2.5 This Code provides minimum requirements for the materials, design, construction, and strength evaluation of structural precast concrete members and systems in any structure designed and constructed under the requirements of the general building code.	="**R1.2.5** The Code provides minimum requirements and exceeding these minimum requirements is not a violation of the Code. The licensed design professional may specify project requirements that exceed the minimum requirements of the Code.
="**1.2.6** 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.	
="**1.2.7** If no general building code is adopted, this Code provides minimum requirements for the materials, design, construction, and strength evaluation of members and systems in any structure within the scope of this Code.	
1.3—Purpose	**R1.3—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, durability, and integrity of precast concrete structures.	**R1.3.1** The Code provides a means of establishing minimum requirements for the design and construction of structural precast concrete, as well as for acceptance of design and construction of precast concrete structures by the building officials or their designated representatives. The Code does not provide a comprehensive statement of all duties of all parties to a contract or all requirements of a contract for a project constructed under the Code.
="**1.3.2** This Code does not address all design considerations.	="**R1.3.2** The minimum requirements in the Code do not replace sound professional judgment or the licensed design professional's knowledge of the specific factors surrounding a project, its design, the project site, and other specific or unusual circumstances to the project.
1.3.3 Requirements for precast concrete systems shall include consideration of loading and restraint in accordance with Section 4.12.	**R1.3.3** Construction means and methods are an integral part of the design for precast concrete. By definition, precast concrete is concrete cast in a location that is not final, so the stripping, handling, storage, shipment, and erection are part of the component design.
1.4—Applicability	**R1.4—Applicability**
1.4.1 This Code shall apply to precast concrete structures designed and constructed under the requirements of the general building code.	
1.4.2 Provisions of this Code shall be permitted to be used for the assessment, repair, and rehabilitation of existing precast concrete components and structures.	**R1.4.2** Specific provisions for assessment, repair, and rehabilitation of existing structures are provided in ACI CODE-562-21. Existing structures in ACI CODE-562 are defined as structures that are complete and permitted for use.