The Public Discussion Period for ACI 318-14

ACI Committee 318, Structural Concrete Building Code, has almost completed its work on ACI 318-14, "Building Code Requirements for Structural Concrete and Commentary." Comments from the ACI Technical Activities Committee regarding the proposed changes to the ACI 318 Code were addressed during the ACI Spring 2014 Convention in Reno, NV. The final task for this committee, which is nearing completion of the 6-year cycle for the current committee membership, will be to respond to public comments.

The purpose of this article is to introduce the public discussion period for ACI 318-14 and invite your participation. A review copy of ACI 318-14 is available via a link posted on the ACI website: **www.concrete.org/aci318**. Please review the document and provide your comments no later than June 17, 2014.

The Reorganization

As many engineers and contractors already know, ACI Committee 318 has reorganized the ACI 318 Code.

In brief, ACI 318-14 has been developed to address design requirements for specific member types such as beams, columns, walls, and diaphragms. This means that the design provisions for a specific member type are contained within a single chapter. The committee also enhanced the readability of the document by developing the various member chapters to have parallel organization, with unified syntax, style, and format among the chapters. Also, the committee changed provisions that previously referred to generic elements, such as "flexural members," to explicitly apply to specific member types (slab, beam, or column).

Further, many lengthy provisions were parsed into multiple, shorter provisions addressing single requirements, and several provisions were defined using tables. During the process, the committee was able to identify gaps in the original provisions and make clarifications where needed.

Early in this code cycle, ACI Committee 318 decided to minimize the number of technical changes to focus on the reorganization of the Code. While most of the technical changes proposed during the balloting process were deferred to the next cycle, the committee agreed that a number of technical changes were necessary during this cycle.

Technical Changes

The technical changes proposed for ACI 318-14 include the removal of some existing provisions, chapters, and appendixes. Provisions in ACI 318-11 and earlier Codes that explained basic statistical considerations in mixture proportioning have been eliminated from ACI 318-14. Instead, ACI 301-10 is referenced. Outdated requirements for post-tensioning ducts and grouting have also been removed from the Code—the Commentary now provides specification guidance. ACI 318-11 Chapter 19, Shells and Folded Plates, has been separated from the body of ACI 318-14. However, with assistance from Joint ACI-ASCE Committee 334, Concrete Shell Design and Construction, ACI Committee 318 has developed ACI 318.2-14, "Building Code Requirements for Concrete Thin Shells." The technical content of this standard matches that of Chapter 19 in ACI 318-11. Also, the contents of two appendixes from ACI 318-11 are not included in ACI 318-14. ACI 318-11 Appendix B, "Alternative Provisions for Reinforced and Prestressed Concrete Flexural and Compression Members," and Appendix C, "Alternative Load and Strength Reduction Factors," have been removed from the Code.

Other technical changes apply to specific provisions in the Code. In the following summary, the ACI 318-14 chapter titles and, in some cases, brief descriptions of the contents are provided along with summaries of significant technical changes:

Chapter 1—General

General information regarding the Code's scope and applicability is provided. A new section on interpretation is included to help users understand the Code's language.

Chapter 2—Notation and Terminology

A list of notation used in the Code and terms with their Code-specific definitions are provided. Several new notations and several new definitions are included.

Chapter 3—Referenced Standards

The standards referenced by the Code are listed with their serial designations, including year of adoption or revision.

Chapter 4—Structural System Requirements

This new chapter provides an overview of requirements for any structural concrete system, including minimum requirements for materials, load paths, analysis, member and system strength, serviceability, durability, structural integrity, and fire resistance.

Chapter 5—Loads

Load requirements are provided. They remain the same as those in 318-11.

Chapter 6—Structural Analysis

Analysis methods from previous codes are provided in a reorganized form to clarify the requirements. New provisions provide minimum requirements for an acceptable finite element analysis for structural concrete members.

Chapter 7—One-Way Slabs

Minimum prestressed shrinkage and temperature reinforcement requirements in post-tensioned slabs are clarified.

Chapter 8—Two-Way Slabs

Requirements for minimum deformed reinforcement for two-way slabs with bonded tendons are added.

Chapter 9—Beams

An acceptable alternative design procedure for slender precast spandrels is added. The provisions for deep beams are also clarified.

Chapter 10—Columns

The requirements for columns are the same as those in ACI 318-11.

Chapter 11—Walls

The requirements for walls are the same as those in ACI 318-11.

Chapter 12—Diaphragms

This new chapter provides requirements for cast-in-place, precast, and topped diaphragms, including forces to be considered, design limits, required strength, and reinforcement detailing.

Chapter 13—Foundations

Design requirements of ACI 318-11 are characterized specifically for shallow foundations or deep foundations.

Chapter 14—Plain Concrete

The equation for the nominal axial strength of plain concrete has been corrected.

Chapter 15—Beam-Column and Slab-Column Joints

The requirements for detailing and design of beam-column and slab-column joints are the same as those in ACI 318-11.

Chapter 16—Connections between Members

The design requirements for connections between discrete members are consolidated in this chapter, and the design requirements for connections of precast members to foundations are clarified.

Chapter 17—Anchoring to Concrete

The requirements for anchoring to concrete are the same as those in Appendix D of ACI 318-11.

Chapter 18—Earthquake-Resistant Structures

Technical changes include:

- Changes regarding requirements for beams resisting high axial force and for columns resisting low axial force;
- Changes regarding requirements for boundary element transverse reinforcement in special structural walls and introduction of slenderness and dimensional limits;
- Modifications of the confinement requirements for columns of special moment frames, and for columns not designated as part of the seismic-force-resisting system in structures assigned to Seismic Design Categories D, E, and F, with high axial load or high concrete compressive strength;
- For beam-column joints of special moment frames, clarification of hooked beam longitudinal reinforcement development length, requirements for joints with headed longitudinal reinforcement, and restrictions on joint aspect ratio; and
- Restrictions on the use of headed reinforcement to make up hoops.

Chapter 19—Concrete: Design and Durability Requirements

This chapter includes updated requirements for strength and water-cementitious materials ratio (w/cm) for consistency across all exposure classes. In addition, the descriptions of exposure classes for freezing and thawing were modified to make selection of the correct exposure class easier for the licensed design professional.

In ACI 318-11, concrete in contact with water was assigned to exposure categories P0 and P1, where low permeability was or was not required, respectively.

In ACI 318-14, the corresponding categories are W0 and W1, and category W0 includes concrete that is dry in service.

Chapter 20—Steel Reinforcement Properties, Durability, and Embedments

For ASTM A615 Grade 60 bars used as longitudinal reinforcement in special seismic systems, the Code now requires the same minimum elongation as ASTM A706. The ACI Code and related ASTM specifications now have harmonized standards for yield test requirements of steel bar reinforcement. Additionally, some previously implicit limits are now explicitly defined as the result of placing information in tables.

Chapter 21—Strength Reduction Factors

The strength reduction factors of ACI 318-11 are clarified.

Chapter 22—Sectional Strength

The equations defining shear strength in two-way members are expressed in terms of shear stress, and the critical section locations for punching shear stresses are clarified.

Chapter 23—Strut-and-Tie Models

The strut-and-tie requirements are the same as those in Appendix A of ACI 318-11.

Chapter 24—Serviceability Requirements

The serviceability requirements are the same as those of ACI 318-11.

Chapter 25—Reinforcement Details

For No. 3 transverse reinforcement, the definitions of the straight extensions have been revised to be identical for a standard hook and a seismic hook. Additionally, mechanical or welded splices with strengths below 125% of the yield strength of the bar are no longer permitted. The associated stagger requirements have been eliminated, and there is no longer a need to specify "full" mechanical or "full" welded splices because all mechanical or welded splices must have strengths that exceed the 125% criterion.

Chapter 26—Construction Documents and Inspection

Construction and inspection requirements have been consolidated, and they are now related to construction documents. The construction requirements are designated either as "design information" or "compliance requirements." Requirements for measuring air content of fresh concrete are also clarified.

Chapter 27—Strength Evaluation of Existing Structures

The strength evaluation requirements are the same as those in ACI 318-11.