Part 1: Organizational Changes

By S. K. Ghosh, Ph.D.

The American Concrete Institute (ACI) published the Building Code Requirements for Structural Concrete (ACI 318-14) and Commentary (ACI 318R-14) in the Fall of 2014. ACI 318-14 has been adopted by reference into the 2015 International Building Code (IBC). Adoption of the 2015 IBC by cities, counties, and states has been rather slow. However, major adoptions are scheduled to follow. The 2016 California Building Code (CBC), based on the 2015 IBC, will be effective in California on January 1, 2017. As of that date, ACI 318-14 will be law within the State of California.

There are very significant organizational as well as technical changes between ACI 318-11 and ACI 318-14. This is the first of a two-part article on these changes. This part is devoted to the organizational changes. Part 2 will describe the technical changes.

Organization of ACI 318-11


ACI 318-11 started with chapters on materials and construction aspects. Analysis and design, general considerations and strength and serviceability requirements were dealt with in two succeeding chapters. Three behavior-based chapters followed: on flexure and axial loads, shear and torsion, and development and splices of reinforcement. A switch was then made to member-based chapters: on two-way slab systems, walls, and footings. The last few chapters were on precast concrete, composite concrete flexural members, prestressed concrete, shells and folded plate members, strength evaluation of existing structures, earthquake-resistant structures, and structural plain concrete. There were also four appendices, including one on strut and tie models and one on anchoring to concrete.

Member-Based Organization for ACI 318-14

While the ACI 318 cycle that produced ACI 318-05 and -08 was still in full swing, it was decided, after long deliberation within ACI, that ACI 318 should be reorganized to be a member-based document. External input was actively sought and considered in the course of those deliberations. The idea was that, within each chapter devoted to a particular member type such as beam or column, the user will find all the requirements necessary to design that particular member type. According to Cary Kopczynski, a member of the ACI 318 committee that produced ACI 318-14, “This will eliminate the need to flip through several chapters to comply with all of the necessary design requirements for a particular structural member, as was necessary with the old organization format. The codes’ new design can be compared to a cookbook: all the ingredients for baking a cake such as eggs, flour, sugar, oil – along with the baking instructions – are in one chapter, instead of individual chapters on eggs, flour, and sugar.”

Toolbox Chapters

One challenge in converting to a member-based organization was where to place the design information that applies to multiple member types, such as development length requirements. To repeat essentially the same information in multiple chapters did not sound like a good idea. So the decision was made to place such information in so-called “toolbox” chapters and to reference the information from the member-based chapters. Chapters 21 through 25 are the toolbox chapters in ACI 318-14.

Overall Changes

There are some overall changes in the makeup of ACI 318-14 that should be noted. There are two new chapters: 4, Structural System Requirements and 12, Diaphragms. Appendix B of ACI 318-11, Alternative Provisions for Reinforced and Prestressed Concrete Flexural and Compression Members, and Appendix C, Alternative Load and Strength Reduction Factors, have been discontinued.

Appendix A, Strut-and-Tie Models is now Chapter 23 and Appendix D, Anchoring to Concrete, is Chapter 17 in the reorganized document. No changes of any significance have been made in the provisions of these two appendices/chapters. Two additional chapters have been relocated without change of content: Chapter 20, now 27, Strength Evaluation of Existing Structures, and Chapter 22, now 24, Structural Plain Concrete.

Chapter 21, now 18, Earthquake-Resistant Structures, has been relocated with change of content; significant technical changes have been made in this chapter. The first three chapters have also remained intact, but with technical changes. These are: Chapter 1, General Requirements, now General; Chapter 2, Notation and Definitions, now Notation and Terminology; and Chapter 3, Materials, now Referenced Standards.

Chapter 16, Precast Concrete, and Chapter 18, Prestressed Concrete no longer exist as separate entities. The provisions of those chapters are now spread over several of the new chapters.

Chapter 19, Shells and Folded Plates, is no longer part of the reorganized document. ACI Committee 318, in collaboration with ACI-ASCE Committee 334, Concrete Shell Design and Construction, has developed ACI 318.2-14, the contents of which match those of ACI 318-11 Chapter 19. The reader may wonder why this document was designated ACI 318.2, rather than ACI 318.1. This is because it was initially planned that ACI 318-11 Chapter 22 on plain concrete would become a separate standard: ACI 318.1. The number was reserved for that purpose. It was later decided to place the contents of ACI 318-11 Chapter 22 in ACI 318-14 Chapter 14.

The Table shows a side-by-side comparison of the organizations of ACI 318-11 and ACI 318-14.

Construction Documents and Inspection

A unique chapter that will probably require some time to get used to is Chapter 26, Construction Documents and Inspection. The chapter starts with the following:

26.1.1 This chapter addresses (a) through (c):
(a) Design information that the licensed design professional shall specify in the construction documents,
(b) Compliance requirements that the licensed design professional shall specify in the construction documents,
(c) Inspection requirements that the licensed design professional shall specify in the construction documents,

Thus, 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.” These are largely existing material that has been rearranged.

The inspection requirements in Section 26.13 are largely taken from Chapter 17 of the 2015 IBC; much of it was previously not part of ACI 318.

Conclusions

ACI 318 has undergone a complete reorganization from its 2011 to its 2014 edition; the last such complete reorganization was from the 1963 to the 1971 edition of ACI 318. The new organization is member-based. The idea is that, within each chapter devoted to beam or column or some other member type, the user will find all the requirements necessary to design that particular member type. Contrary to the fairly widely held perception that the reorganization is all that has happened, ACI 318-14 does contain a number of significant technical changes, which will be discussed in Part 2 of this article.

This article was originally published in the PCI Journal (March/April 2016) and this condensed version is reprinted with permission.
References

1. American Concrete Institute (ACI). (2014). *Building Code Requirements for Structural Concrete* (ACI 318-14) and *Commentary* (ACI 318R-14). Farmington Hills, MI.


5. American Concrete Institute (ACI). (2014). *Building Code Requirements for Concrete Thin Shells* (ACI 318.2-14) and *Commentary* (ACI 318.2R-14). Farmington Hills.