Chapter 3:
Compliance Methods

General Comments

This chapter contains the provisions that explain how the code is intended to be applied. In addition, this chapter provides the procedures for seismic design and evaluation that apply throughout the code. These provisions were originally located within Chapter 1, but due to the technical nature of the seismic provisions and the fact that administration provisions are often heavily amended, a standalone chapter was necessary.

In terms of the application of the code, this chapter explains the three main components of the code, which include the following:

- Prescriptive method,
- Work area method, and
- Performance method.

It is intended that one method of compliance is chosen and applied in whole. The first of these methods is the prescriptive method, which is covered in Chapter 4. This chapter is an excerpt from Chapter 34 of the *International Building Code*® (IBC®) (Sections 3403 through 3211). It addresses additions, alterations, repairs, change of occupancy and accessibility in existing buildings. The requirements are fairly general with a strong emphasis on structural evaluation and requirements for additions, repairs and alterations. Section 410, which addresses accessibility, provides a baseline of accessible improvement based upon the type of work occurring in a building.

The second method and core method introduced by the code is the work area method, which is addressed in Chapters 5 through 13. This concept was intended to provide more flexibility to encourage the reuse and continued use of existing buildings. More specifically, the provisions allow different levels of compliance based upon the level of work occurring. Chapter 5 first classifies the type and level of work and then, based upon that classification, specific provisions are applied. The various types and levels of work include the following:

- Repairs (Chapter 6)
- Alteration Level 1 (Chapter 7)
- Alteration Level 2 (Chapter 8)
- Alteration Level 3 (Chapter 9)
- Change of occupancy (Chapter 10)
- Additions (Chapter 11)
- Historic buildings (Chapter 12)
- Relocated or moved buildings (Chapter 13)

The final method provided in this code is the performance compliance method found in Chapter 14. This section is a duplication of Section 3412 of the *International Building Code*® (IBC®). This section provides a scoring method to determine the overall level of safety of a building. The main focus is on fire and life safety provisions, but base structural and accessibility requirements are also addressed. The objective of this section is to provide an alternative compliance option that enables improvements to be made that will raise the score to a minimum level without strict compliance with the provisions of the IBC.

This chapter also provides options related to seismic evaluation and design, which are intended to provide flexibility when addressing seismic design. The provisions help to determine which procedures and methods are to be applied when addressing seismic design in existing buildings. In some cases, the code requires compliance with the seismic design provisions of the IBC (Section 301.1.4.1), while in other sections, reduced seismic design provisions are permitted (Section 301.1.4.2). In both sections, specifics are provided regarding applicable procedures and methods. More detailed discussion about these methods is provided within the commentary to Sections 301.1.4, 301.1.4.1 and 301.1.4.2. Much of the provisions are intended to facilitate an overall increase in seismic performance in existing buildings. Typically, buildings with higher occupant loads and those with increased importance due to their significance to the community will have more restrictive requirements.

Section 301.2 is provided to make sure that all applicable requirements for existing situations are addressed in various *International Codes*® and the *National Electrical Code*® (NFPA 70). More specifically, codes like the *International Plumbing Code*® (IPC®) have requirements for existing installations and how alterations or additions are addressed. These provisions are still applicable even when applying this code. Additionally, this section does state that where a conflict occurs, this code takes precedence.

Purpose

The purpose of this chapter is to define the three compliance options that are available to the users of the code and to lay out the methods to be used for seismic design and evaluation throughout the code.

SECTION 301 COMPLIANCE METHODS

301.1 General. The *repair*, *alteration*, *change of occupancy*, *addition* or relocation of all *existing buildings* shall comply with one of the methods listed in Sections 301.1.1 through 301.1.3 as selected by the applicant. Application of a method shall be the sole basis for assessing the compliance of work performed under a single permit unless otherwise approved by the *code official*. Sections 301.1.1 through 301.1.3 shall not be applied in combination with each other. Where this code requires consideration of the seismic force-resisting system of an *existing building* subject to *repair*, *alteration*, *change of occupancy*, *addition* or relocation of *existing buildings*, the seismic evaluation and design shall be based on Section 301.1.4 regardless of which compliance method is used.

Exception: Subject to the approval of the *code official*, *alterations* complying with the laws in existence at the time the building or the affected portion of the building was built shall be considered in compliance with the provisions of this code unless the building is undergoing more than a limited structural *alteration* as defined in Section 907.4.3. New structural members added as part of the *alteration* shall comply with the *International Building Code*. *Alteration*s of *existing buildings* in *flood hazard areas* shall comply with Section 701.3.

❖ This section explains the options available to a designer or owner when dealing with construction related to existing buildings: prescriptive compliance method (Section 301.1.1), work area compliance method (Section 301.1.2) and performance compliance method (Section 301.1.3). This section also provides procedures for evaluation and design of seismic-force-resisting systems of existing buildings where consideration of seismic forces is required by Section 301.1.4.

There is one alternative to using these three compliance methods that allows for compliance with the laws in existence at the time the structure was originally built, unless the building has sustained substantial structural damage or is undergoing more than a limited structural alteration. Repairs and alterations in flood hazard areas have additional requirements to the laws in existence at the time the structure was originally built.

301.1.1 Prescriptive compliance method. *Repairs*, *alterations*, *additions* and *changes of occupancy* complying with Chapter 4 of this code in buildings complying with the *International Fire Code* shall be considered in compliance with the provisions of this code.

❖ This section allows compliance in accordance with Chapter 4 of the code. Chapter 4 is a duplication of Sections 3401 through 3411 of the IBC. These provisions are intended to prescribe specific minimum requirements for construction related to existing buildings, including additions, alterations, repairs, fire escapes, glass replacement, change of occupancy, historic buildings, moved structures and accessibility.

301.1.2 Work area compliance method. *Repairs*, *alterations*, *additions*, changes in occupancy and relocated buildings complying with the applicable requirements of Chapters 5 through 13 of this code shall be considered in compliance with the provisions of this code.

❖ This section allows compliance in accordance with Chapters 5 through 13 of the code. These chapters contain provisions that are based on a proportional approach to compliance where upgrades are triggered by the type and extent of the work.

301.1.3 Performance compliance method. *Repairs*, *alterations*, *additions*, changes in occupancy and relocated buildings complying with Chapter 14 of this code shall be considered in compliance with the provisions of this code.

❖ This section allows compliance in accordance with Chapter 14 of the code. This chapter is a duplication of Section 3412 of the IBC. This chapter provides for evaluating a building based on fire safety, means of egress and general safety.

[B] 301.1.4 Evaluation and design procedures. The seismic evaluation and design shall be based on the procedures specified in the *International Building Code*, ASCE 31 or ASCE 41. The procedures contained in Appendix A of this code shall be permitted to be used as specified in Section 301.1.4.2.

❖ This section lists the documents that contain the provisions to be used for the seismic evaluation of an existing building as well as the design of any needed repairs. Since the scope of these documents varies considerably, brief descriptions are given below.

***International Building Code®* (IBC®)**

The IBC is comprehensive model building code with seismic provisions that are based, for the most part, on the National Earthquake Hazards Reduction Program (NEHRP) *Recommended Provisions for Seismic Regulations for New Buildings and Other Structures*. The requirements are intended to minimize the hazard to life for all buildings, increase the expected performance of higher occupancy buildings as compared to ordinary buildings and improve the capability of essential facilities to function during and after an earthquake. In addition to minimum seismic loading criteria, the earthquake design provisions include requirements for special inspection and testing as well as material-specific design requirements. Achieving the intended performance depends on a number of factors, including the structural framing type, configuration and construction materials, for example.

The significant earthquake load concepts include the following:

1. The ground motions are based on a maximum considered earthquake (MCE), which has an approximate average return period of 2,500 years in most of the United States. United States Geological Survey (USGS) ground motion response acceleration maps [IBC Fig-

ures 1613.3.1(1) through 1613.3.1(6)] provide spectral response accelerations at short periods (S_S) and at a one-second period (S_1). These levels of ground motion are also used in ASCE 31 and 41.

2. Design for the effect of two-thirds of the MCE: Considering the margin of safety of 1.5 inherent in seismic design practice, this achieves collapse prevention under MCE level ground motions. It is also intended that damage from the "design earthquake" ground motion would be repairable. For essential facilities (Risk Category IV) it is intended that damage from the "design earthquake" ground motion be relatively minor and allow continued occupancy and function of the facility. For higher ground motions, the intent is that there be a low probability of structural collapse.
3. Risk category and importance factors: The IBC assigns buildings to one of the four risk categories that are summarized in Commentary Figure 301.1.4(1). It is the intent to provide increasingly higher performance as the risk category increases from I through IV. This is achieved in part by applying an importance factor in determining the design load. The importance factor specified in the load provisions of ASCE 7 directly impacts the calculation of seismic (as well as wind and snow) loads. The magnitude of the design load varies in proportion to the importance factor and a higher value is assigned to buildings with an occupancy that warrants a higher level of performance.
4. Nonlinear seismic behavior is accounted for through use of equivalent lateral forces that are reduced by a response modification factor (R). This approximates the internal forces under the design earthquake. The corresponding building displacements, however, must be increased by the deflection amplification factor (C_d) in meeting the drift limits. These factors are based on the type of seismic force-resisting system that is provided and are located in the referenced ASCE 7 load standard.
5. Detailing and limitations on the seismic-force-resisting system are a function of a structure's seismic design category classification, which considers the seismicity at the site, type of soil present at the site and the nature of the building occupancy. Since several code and *Guidelines for Seismic Retrofit of Existing Buildings* (GSREB) requirements use the seismic design category as a threshold and neither document contains the criteria for determining a building's seismic design category, Commentary Figure 301.1.4(2) provides step-by-step instructions on how to determine a structure's seismic design category using the IBC seismic criteria.

Two levels of IBC seismic forces are used as the basis for the code requirements for seismic analysis

1. Determine the mapped MCE spectral response acceleration at short periods, S_s, and at A 1-second period, S_1, for the site from Figures 1613.5(1) through 1613.5(4).
2. Determine the (soil) site class in accordance with Table 1613.5.2.
3. Determine the site coefficients, F_a and F_v, from Tables 1613.5.3(1) and 1613.5.3(2), respectively.
4. Determine the design spectral response acceleration at short periods, S_{DS}, and at a 1-second period, S_{D1}, as follows:

   $S_{DS} = (2/3)(F_a)(S_s)$

   $S_{D1} = (2/3)(F_v)(S_1)$
5. Determine the seismic design category as prescribed by Tables 1613.5.6(1) and 1616.5.6(2). The highest (most restrictive) of the seismic design categories from the two tables is the category assigned to the building.

Figure 301.1.4(2)
DETERMINATION OF SEISMIC DESIGN CATEGORY USING THE *INTERNATIONAL BUILDING CODE*

RISK CATEGORIES	NATURE OF OCCUPANCY	SEISMIC IMPORTANCE FACTOR FROM ASCE 7
I	Buildings and other structures that represent a low hazard to human life in the event of failure	1.0
II	Buildings and other structures except those listed in Categories I, III and IV	1.0
III	Buildings and other structures that represent a substantial hazard to human life in the event of failure	1.25
IV	Buildings and other structures designated as essential facilities	1.5

Figure 301.1.4(1)
RISK CATEGORIES AND IMPORTANCE FACTORS