Chapter 3:
Provisions for All Compliance Methods

General Comments

This chapter has several roles. One of the most important is defining how the code is to be applied. In other words, it explains how to navigate the various methods and what aspects of work fall outside those methods. The chapter defines some ground rules for applicability to situations such as dangerous buildings and acceptable building materials. In addition, this chapter provides a number of generally applying requirements for all methods, such as the procedures for seismic design accessibility, smoke alarms carbon monoxide detection and acceptable exterior wall covering and envelope materials.

Section 301 establishes how the three compliance options for additions, alterations and changes of occupancy are applied to existing buildings. These options also apply to historic buildings and include:

- Prescriptive method.
- Work area method.
- Performance method.

There are some aspects of the code that fall outside the three methods, including repairs (Chapter 4) and relocated buildings (Chapter 14).

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 5. This chapter was originally excerpted from a portion of Chapter 34 of the *International Building Code*® (IBC®). Chapter 34 of the IBC no longer contains these provisions and is simply noted as reserved. Section 101.4.7 of the IBC refers users to the *International Existing Building Code*® (IEBC®) for existing building issues. Chapter 5 addresses additions, alterations and change of occupancy in existing and historic buildings. The method of compliance is more simplistic and more administrative than the work area method. In addition, Section 504 covers where fire escapes are permitted. Section 505 deals with windows, including replacement, and where opening control devices and emergency escape openings are required.

The second method introduced by the code is the work area method, which is addressed in Chapters 6 through 12. This concept is intended to provide more flexibility to encourage the reuse and continued use of existing buildings and is more technical and less administrative than the prescriptive method. More specifically, the provisions allow different levels of compliance based on the level of work occurring. Chapter 6 first classifies the type and level of work and then, based on that classification, specific provisions are applied. The various types and levels of work include the following:

- 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).

The final method provided in this code is the performance compliance method found in Chapter 13. Chapter 13 utilizes a scoring method to determine the overall safety level of a building. This method allows for existing buildings to be evaluated to determine if alterations or a change of occupancy, while not meeting new construction requirements, will meet a certain level of safety. The focus is on nonstructural fire and life-safety provisions. Base structural requirements are also addressed (Section 1301.4.1). The structural provisions are more basic than the prescriptive and work area method. The prescriptive and work area methods are more comprehensive and consistent with one another in terms of the structural requirements. The objective of this chapter 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 originates from IBC Chapter 34 (2012 and previous editions).

Section 302 addresses generally applicable provisions for the overall code, such as issues related to dangerous conditions, applicability of other codes to existing buildings, allowances related to existing materials, and applicability of occupancy classifications of the IBC when applying this code.

Section 303 addresses when storm shelters are required and the occupant load required for such shelters.

Section 304 provides options related to seismic evaluation and design, which are intended to provide flexibility when addressing seismic design. These evaluation tools work with both the prescriptive and work area methods. 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 (see Section 304.3.1), while in other cases, reduced seismic design provisions are permitted (see Section 304.3.2 of this code). In both sections, specifics are provided regarding applicable procedures and methods. In large part, these 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 to the community will have more restrictive requirements.

Section 305 simply provides a pointer to the testing requirements for in-situ load tests that are in Section 1708 of the IBC.

Section 306 provides requirements for accessibility that are applicable to all existing buildings within the scope of this code.

Section 307 provides requirements for smoke alarms that apply consistently to all three methods.

Section 308 provides requirements for Carbon Monoxide (CO) detection that apply consistently to all three methods.

Section 309 addresses the need to ensure that replacement or addition of exterior wall coverings and exterior wall envelopes comply with the IBC.

Purpose

The purpose of this chapter is to provide generally applicable minimum requirements for all existing buildings undergoing repairs, alterations, additions, change of occupancy or relocation, and to define the types and levels of work applicable. This chapter also addresses the requirements for storm shelters, methods to be used for seismic design and evaluation, accessibility, smoke alarms, CO detection and exterior wall coverings intended to be applied to all existing buildings where the provisions would be applicable.

SECTION 301
ADMINISTRATION

301.1 Applicability. The *repair*, *alteration*, *change of occupancy*, *addition* or relocation of all *existing buildings* shall comply with Section 301.2, 301.3 or 301.4. The provisions of Sections 302 through 309 shall apply to all *alterations*, *repairs*, *additions*, relocation of structures and *changes of occupancy* regardless of compliance method.

❖ Overall, this section establishes a roadmap for the application of this code to the different types of work addressed for existing buildings: repairs (see Section 301.2); alterations, additions or change of occupancy (see Section 301.3); and relocated buildings (see Section 301.4).

301.1.1 Bleachers, grandstands and folding and telescopic seating. Existing bleachers, grandstands and folding and telescopic seating shall comply with ICC 300.

❖ This section simply ensures that any existing bleachers, grandstands and folding and telescopic seating appropriately comply with ICC 300. Note that repairs and relocations of buildings are specifically dealt with in Chapter 4 and 14, respectively. However, it is important to note that ICC 300 includes provisions for new construction as well as maintenance, repair, alterations and relocation.

301.2 Repairs. *Repairs* shall comply with the requirements of Chapter 4.

❖ Requirements for repairs, as defined in Chapter 2, are given in Chapter 4. See Chapter 4 for commentary regarding specific aspects of repairs. It is important to highlight that the provisions for repairs are independent of the three methods presented in this code and apply consistently to any repairs. One exception to this is for historic buildings, which simply references Chapter 12 for repairs.

301.3 Alteration, addition or change of occupancy. The *alteration*, *addition* or *change of occupancy* of all *existing buildings* shall comply with one of the methods listed in Section 301.3.1, 301.3.2 or 301.3.3 as selected by the applicant. Sections 301.3.1 through 301.3.3 shall not be applied in combination with each other.

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. New structural members added as part of the *alteration* shall comply with the *International Building Code*. This exception shall not apply to the following:

1. *Alterations* for accessibility required by Section 306.
2. *Alterations* that constitute *substantial improvement* in *flood hazard areas*, which shall comply with Sections 503.2, 701.3 or 1301.3.3.
3. Structural provisions of Section 304, Chapter 5 or to the structural provisions of Sections 706, 805 and 906.

❖ This section explains the options available to a designer or owner where dealing with construction related to existing buildings: prescriptive compliance method (see Section 301.1.1), work area compliance method (see Section 301.1.2) and performance compliance method (see Section 301.1.3).

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, under certain conditions. These conditions are as follows:

Accessibility. The building must comply with Section 306, which establishes minimal compliance with the Americans with Disabilities Act.

Structural. The building must have sustained substantial structural damage or be undergoing more than a limited structural alteration.

Flood hazard design. Where alterations of a building in a flood hazard area constitute substantial improvement (see Section 104.2.1), the building must be brought into compliance with the current requirements for flood-resistant construction rather than compliance with the requirements in existence at the time the structure was originally built.

301.3.1 Prescriptive compliance method. *Alterations*, *additions* and *changes of occupancy* complying with Chapter 5 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 5 of the code, which is referred to as the prescriptive method. These provisions are intended to

prescribe specific minimum requirements for construction related to existing buildings, including additions, alterations, fire escapes, window replacement, change of occupancy and historic buildings. This method is mainly administrative in approach. There are several topics that have been addressed to specifically correlate with the work area method. These topics include structural requirements, flood hazard areas, emergency escape and rescue openings and window fall prevention device requirements, Historic buildings are also addressed in this chapter.

301.3.2 Work area compliance method. *Alterations*, *additions* and *changes of occupancy* complying with the applicable requirements of Chapters 6 through 12 of this code shall be considered in compliance with the provisions of this code.

❖ This section allows compliance in accordance with Chapters 6 through 12 of the code, which is referred to as the work area method. These chapters contain provisions based on a proportional approach to compliance where upgrades are triggered by the type and extent of the work. The work area method is a more technical and less administrative method of compliance that provides more detailed direction as to what constitutes code compliance. Chapter 6 classifies the various types of work, which include alterations, changes of occupancy, additions and historic buildings. This includes clarifying the differences between Level 1, 2 or 3 alterations.

301.3.3 Performance compliance method. *Alterations*, *additions* and *changes of occupancy* complying with Chapter 13 of this code shall be considered in compliance with the provisions of this code.

❖ This section allows compliance for work involving alterations of any size, additions and changes of occupancy in accordance with Chapter 13 of the code, which is referred to as the performance method. This chapter provides a scoring method for evaluating a building based on fire safety, means of egress and general safety. The focus is on nonstructural fire and life-safety provisions. Subjects such as structural provisions are addressed in this chapter but only at a more administrative level.

Provisions in this chapter are based on a numerical scoring system involving 21 safety parameters and the degree of code compliance for each parameter. Minimum scores are provided within Chapter 13 and once the scores for that specific building or portion of building are determined, the numbers are compared. A building score equal to or higher than the minimum safety score demonstrates compliance. Where a building fails to meet the minimum score, features can be added to increase the score to achieve compliance.

301.4 Relocated buildings. Relocated buildings shall comply with the requirements of Chapter 14.

❖ Relocated buildings are a unique type of work for existing buildings and are, therefore, addressed in a separate chapter of the code. Like repairs, relocated building provisions are independent of the three compliance methods. For detailed commentary, see Chapter 14.

SECTION 302
GENERAL PROVISIONS

302.1 Dangerous conditions. The *code official* shall have the authority to require the elimination of conditions deemed *dangerous*.

❖ This section enables the code official to address dangerous conditions for any type of situation that may arise during renovations to existing buildings. "Dangerous" is specifically defined in Chapter 2 and is related to structural stability. "Unsafe" is more general and is also specifically defined in Chapter 2. Provisions for unsafe buildings are located in Section 115.

302.2 Additional codes. *Alterations, repairs, additions* and *changes of occupancy* to, or relocation of, *existing buildings* and structures shall comply with the provisions for *alterations, repairs, additions* and *changes of occupancy* or relocation, respectively, in this code and the *International Energy Conservation Code*, *International Fire Code*, *International Fuel Gas Code*, *International Mechanical Code*, *International Plumbing Code*, *International Private Sewage Disposal Code*, *International Property Maintenance Code*, *International Residential Code* and NFPA 70. Where provisions of the other codes conflict with provisions of this code, the provisions of this code shall take precedence.

❖ This section clarifies the relationship between this code and the existing building provisions found in other I-Codes and NFPA 70. Where alterations and repairs are made to existing mechanical, fuel gas and plumbing systems, the provisions of the applicable I-Codes and NFPA 70 for alterations and repairs must be followed. Those codes indicate the extent to which existing systems must comply with the stated requirements. Where portions of existing building systems, such as plumbing, fuel gas, mechanical and electrical systems, are not being altered or repaired, those systems may continue to exist without being upgraded as long as they are not hazardous or unsafe to the building occupants.

Another important element of this section is that this code will take precedence if a conflict occurs between one of the listed codes and this code. This is only as far as it concerns requirements for alteration, repairs, additions and change of occupancy; however, this would not address a situation where another code, such as the IFC, retroactively required changes to a building regardless if any repairs, alterations, additions or changes of occupancy were occurring.

302.2.1 Additional codes in health care. In existing Group I-2 occupancies, ambulatory health care *facilities*, outpatient clinics and hyperbaric *facilities*, *alterations*, *repairs*, *additions* and *changes of occupancy* to, or relocation of, *existing buildings* and structures shall also comply with NFPA 99.

❖ NFPA 99 specifies additional requirements for building systems in health care facilities beyond NFPA 70. This reference to NFPA 99 is necessary in order to meet federal requirements for health care facilities. This section aligns the electrical systems installation requirements for outpatient clinics, Group B ambulatory care facilities and Group I-2 facilities.

NFPA 99 uses a risk-based approach to system design, installation and maintenance in healthcare facilities (Group I-2 facilities, ambulatory care facilities and outpatient clinics). Four levels of systems categories are defined in NFPA 99, based on the risks to patients and caregivers in the facilities. The categories are as follows:

Category 1: Systems that are expected to be functional at all times. Failure of these systems is likely to cause major injury or death.

Category 2: Systems are expected to have a high level of reliability. Failures of these systems are likely to cause minor injury to patients or caregivers; however, limited short durations of equipment downtime can be tolerated. Category 2 systems are not critical for life support.

Category 3: Normal building system reliabilities are expected. Such systems support patient needs, but failure of such equipment or systems would not immediately affect patient care and are not critical for life support.

Category 4: Such systems have no impact on patient care and would not be noticeable to patients in the event of failure.

302.3 Existing materials. Materials already in use in a building in compliance with requirements or approvals in effect at the time of their erection or installation shall be permitted to remain in use unless determined by the **code** official to be *unsafe*.

❖ If a material or system had been approved before the code took effect, it can continue to be used as long as the material or system is not detrimental to the health or safety of the building occupants or the public. Specifically, a material or system cannot be "unsafe" as defined in Chapter 2 and as addressed by Section 115. In this regard, the code is not intended to be retroactive.

302.4 New and replacement materials. Except as otherwise required or permitted by this code, materials permitted by the applicable code for new construction shall be used. Like materials shall be permitted for *repairs* and *alterations*, provided that *unsafe* conditions are not created. Hazardous materials shall not be used where the code for new construction would not permit their use in buildings of similar occupancy, purpose and location.

❖ There are two options for materials used in repairs to an existing building. Generally, the materials used for repairs should be those that are presently required or permitted for new construction in accordance with the I-Codes. It is also acceptable to use materials consistent with those that are already present, except where those materials pose a hazard. This allowance follows the general concept that any repair should not make a building more hazardous than it was prior to the repair. It is generally possible to repair a structure, its components and its systems with materials consistent with those materials that were used previously; however, where materials that are now deemed hazardous are involved in the repair work, they may no longer be used. For example, the code identifies asbestos and lead-based paint as two common hazardous building materials that cannot be used in the repair process. Certain materials previously considered acceptable for building construction are now known to be threats to the health of occupants and would be unsafe.

[BS] 302.4.1 New structural members and connections. New structural members and connections shall comply with the detailing provisions of the *International Building Code* for new buildings of similar structure, purpose and location.

Exception: Where alternative design criteria are specifically permitted.

❖ Regardless of the scope of work, new connections and new structural members must be in compliance with the current provisions of the IBC. This is consistent with the general philosophy of this code for any new construction. There is an exception, however, to allow for alternative design criteria. Specifically, the performance-based seismic criteria in ASCE 41 and the reduced seismic criteria referenced in numerous places in this code would not meet the current provisions of the IBC for strength, stiffness or detailing. This exception, therefore, is needed to allow those alternatives to be applied.

302.5 Occupancy and use. Where determining the appropriate application of the referenced sections of this code, the occupancy and use of a building shall be determined in accordance with Chapter 3 of the *International Building Code*.

❖ This section provides a link to the occupancy classifications in the IBC. Any time a provision is based on occupancy classification, that classification is determined through IBC requirements, not from codes under which the building was originally built. Occupancy classifications have changed over the years and varied as to how they were named in previous codes.

In the early years of the last century, the essence of regulatory safeguards from fire was to provide a reasonable level of protection to property. The idea was that if property was adequately protected from fire, then the building occupants would also be protected.

From this outlook on fire safety, the concept of equivalent risk has evolved in the code. This concept maintains that, in part, an acceptable level of risk against the damages of fire, respective to a particular occupancy type (group), can be achieved by limiting the height and area of buildings containing such occupancies, according to the building's construction type (in other words, its relative fire endurance).

The concept of equivalent risk involves three interdependent considerations:

1. The level of fire hazard associated with the specific occupancy of the facility.
2. The reduction of fire hazard by limiting the floor area(s) and the height of the building based on the fuel load (combustible contents and burnable building components).
3. The level of overall fire resistance provided by the type of construction used for the building.

The interdependence of these fire safety considerations can be seen by first looking at Tables 601 and 705.5 of the IBC, which show the fire-

Chapter 4: Repairs

General Comments

Prior to the 2018 edition of the IEBC, the repair provisions were provided separately within the prescriptive, work area and performance compliance methods. This caused confusion in both the interpretation of the code as well as maintenance of the code. The repair provisions are now provided in Chapter 4, as a "stand-alone" chapter, and are not tied to the compliance paths described in Chapters 5through 13. Repairs are defined in Section 202 as "the reconstruction, replacement, or renewal of any part of an existing building for the purposes of its maintenance or to correct damage." This seems to be simple enough; however, within the context of different types of building elements, specific rules must be applied. For instance, a replacement of glazing materials in what is defined in the IBC or IRC as a hazardous location must be safety glazing. Another example is structural repairs. In general, structural repairs are simply required to restore the structure in such a manner that will not make the building less complying (with the latest edition of the codes) than it was before the repair was undertaken. However, when buildings have been subjected to damage by earthquake, snow, or wind loads, then there are additional concerns that need to be considered before undertaking a repair. This is true for other technical disciplines. Section 402 addresses glazing replacement, Section 403 address fire protection systems, Section 404 addresses means of egress, Section 405 addresses structural systems, Section 406 addresses electrical systems, Section 407 addresses mechanical systems and Section 408 addresses plumbing systems.

Purpose

Chapter 4 provides requirements for repairs of existing buildings. The provisions define conditions under which repairs may be made using materials and methods like those of the original construction or the extent to which repairs must comply with requirements for new buildings.

SECTION 401 GENERAL

401.1 Scope. *Repairs* shall comply with the requirements of this chapter. *Repairs* to *historic buildings* need only comply with Chapter 12.

❖ This chapter provides requirements for repairs to buildings and building systems. This section simply establishes that for any repair undertaken, this chapter needs to be consulted to determine if there are any specific requirements. Historic buildings, however, present a unique problem with regard to the preservation of the elements of the building that make it historic; therefore, Chapter 12, specifically Section 1202, addresses repairs to historic buildings.

401.1.1 Bleachers, grandstands and folding and telescopic seating. *Repairs* to existing bleachers, grandstands and folding and telescopic seating shall comply with ICC 300.

❖ On February 24, 1999, the Bleacher Safety Act of 1999 was introduced in the House of Representatives. The bill, which cites the International Code Council and the code, authorized the US Consumer Product Safety Commission (CPSC) to issue a standard for bleacher safety. This was in response to concerns relative to accidents on bleacher-type structures. As a result, the CPSC developed and revised *Guidelines for Retrofitting Bleachers*. The ICC Board of Directors decided that a comprehensive standard dealing with all aspects of both new and existing bleachers was warranted. ICC 300 was completed in December 2001 and submitted to ANSI on January 1, 2002. ICC 300 was reissued with some revisions in 2007, 2012 and 2017. ICC 300 provides minimum requirements for the alteration, repair, operation and maintenance of, and new, bleacher systems.

401.2 Compliance. The work shall not make the building less complying than it was before the *repair* was undertaken.

❖ The general limitation on repairs is that the level of safety, health and public welfare of the existing building must not be reduced by any work being performed. This requirement can be broadly interpreted, as its applications vary on a case-by-case situation; however, the level of safety provided by the structure and systems, such as plumbing and mechanical, is not to be decreased in the course of making repairs.

[BS] 401.3 Flood hazard areas. In flood hazard areas, *repairs* that constitute *substantial improvement* shall require that the building comply with Section 1612 of the *International Building Code*, or Section R322 of the *International Residential Code*, as applicable.

❖ If located in designated flood hazard areas, buildings and structures that are damaged by any cause are to be examined to determine if the damage constitutes substantial damage, in which the cost of repairing or restoring the building or structure to its predamaged condition equals or exceeds 50 percent of its market value before the damage occurred. All substantial improvements and repairs of buildings and structures that are substantially damaged are to meet the flood-resistant provisions of the *International Building Code*® (IBC®) or *International Residential Code*® (IRC®).

SECTION 402
BUILDING ELEMENTS AND MATERIALS

402.1 Glazing in hazardous locations. Replacement glazing in hazardous locations shall comply with the safety glazing requirements of the *International Building Code* or *International Residential Code* as applicable.

Exception: Glass block walls, louvered windows and jalousies repaired with like materials.

❖ Where glazing in an existing building is replaced within the same building, it must comply with the current requirements and standards of the IBC or the IRC, as applicable. This includes installing new glass in an existing window, door or other type of opening, even where the glass replaced did not comply with the standards of the code.

Glass block walls are described in Chapter 21 of the IBC, which eliminates the Consumer Product Safety Commission (CPSC) test requirement. Glass block walls are not required to meet the test requirements of CPSC 16 CFR, Part 1201 for safety glazing; however, there are still safety requirements placed on the installation of the glass block.

Louvered and jalousie windows are exempt from safety glazing requirements in all applications, including those where a flat plane of glass is otherwise required to be safety glass. This exception is based on records that show no cutting or piercing injuries occur from persons impacting the glass edge; therefore, safety glass would not have an effect on this type of injury. There are also practical production reasons associated with fabricating safety glazing for the relatively long, thin slats.

SECTION 403
FIRE PROTECTION

403.1 General. *Repairs* shall be done in a manner that maintains the level of fire protection provided.

❖ Any level of fire protection that currently exists in a building must not be adversely affected as a result of any repair. For example, repairing the existing ceiling and sprinkler heads or repairing the fire alarm system equipment must ultimately provide the same level of coverage and protection that existed prior to the repairs being undertaken.

SECTION 404
MEANS OF EGRESS

404.1 General. *Repairs* shall be done in a manner that maintains the level of protection provided for the means of egress.

❖ Any level of protection provided by the means of egress that currently exists in a building must not be adversely affected as a result of any repair. For example, repairing the walls and doors of a corridor must ultimately provide the same level of protection that existed prior to the repairs being undertaken.

SECTION 405
STRUCTURAL

[BS] 405.1 General. Structural *repairs* shall be in compliance with this section and Section 401.2.

❖ This section gives the requirements that pertain to structural materials and elements in need of repair. Section 405.2.1 addresses repairs for less than substantial structural damage, Section 405.2.3 addresses repairs for substantial structural damage to vertical elements of the lateral force-resisting system and Section 405.2.4 addresses repairs for structural damage to gravity load-carrying components.

[BS] 405.2 Repairs to damaged buildings. *Repairs* to damaged buildings shall comply with this section.

❖ Buildings can suffer damage from numerous sources. Natural disasters, such as earthquakes, floods, hurricanes and tornadoes, can cause extensive damage over widespread areas, depending on the severity of the event. Water intrusion due to a failure in the building envelope, termite infestations or exposure to corrosive chemicals can all lead to the deterioration of structural members over time. For the most part, this section does not differentiate between the possible causes of the damage (the exceptions are Sections 405.2.3.2 and 405.2.3.3). Needless to say, determining the root cause of any damage would be advisable so that an owner can ascertain the risk of a recurrence and, if necessary, develop a plan to address that risk.

The primary concern in determining how repairs are to be accomplished is establishing the extent of the damage that has been sustained to see if it exceeds either of the thresholds contained in the definition of "Substantial structural damage." Where it does not, Section 405.2.1 applies and the repairs can typically be limited to restoring the building to its predamaged state. For buildings that have suffered substantial structural damage, the approach to repairs is dependent on whether that damage is to elements of the lateral system (see Section 405.2.3) or only to elements of the gravity system (see Section 405.2.4). This parallels the classes of substantial structural damage defined in Section 202. The definition of "Substantial structural damage" would itself necessitate some preliminary level of structural evaluation.

There are two repair requirements that are not related to the extent of the damage. Dangerous conditions must always be eliminated (see Section 302.1) and any new structural members and connections must meet the code requirements for new construction.

[BS] 405.2.1 Repairs for less than substantial structural damage. Unless otherwise required by this section, for damage less than *substantial structural damage*, the damaged elements shall be permitted to be restored to their predamage condition.

❖ For damage less than substantial structural damage, repairs are allowed that restore the building to its predamaged state using materials and strengths that

existed prior to the damage. The only exception to this is damage due to snow loads, as addressed in Section 405.2.1.1, and possibly structures that have sustained disproportionate earthquake damage in Seismic Design Category D, E or F, as addressed in Section 405.2.2.

[BS] 405.2.1.1 Snow damage. Structural components whose damage was caused by or related to snow load effects shall be repaired, replaced or altered to satisfy the requirements of Section 1608 of the *International Building Code*.

❖ Damage due to snow loads must be repaired as required by the code for new construction. The reason for this is that snow loads, especially with the effects of climate change, are different from dead, live, earthquake and wind loads that are otherwise addressed in Chapter 4. Existing framing carrying dead and live loads generally does not require upgrades even when it is nonconforming because it has a history of adequate service; however, design level snow loads do not have that history. Unlike wind or earthquake loads, snow loads at damaging or design levels are likely to occur again within a few years; thus, it is folly to allow deficient components to be repaired only to the state in which we can expect them to be damaged again next winter.

[BS] 405.2.2 Disproportionate earthquake damage. A building assigned to Seismic Design Category D, E or F that has sustained *disproportionate earthquake damage* shall be subject to the requirements for buildings with substantial structural damage to vertical elements of the lateral force-resisting system.

❖ The basic intent of the *International Existing Building Code*® (IEBC®) is to identify especially vulnerable buildings at critical points in their useful lives and to require evaluation and possibly upgrade. Sections 405.2.3 and 405.2.4 address substantially damaged buildings. The code requires a seismic upgrade for those found to be especially vulnerable. The high-damage threshold (33 percent capacity loss) is appropriate, but it will only ever be reached where the earthquake shaking was also high—that is, the current provision fails to find other equally or even more vulnerable buildings in the same community that happened to be outside the area of strongest shaking.

This requirement uses an earthquake as an opportunity to find and proactively improve a community's most vulnerable buildings—those prone to disproportionate earthquake damage. As proposed, disproportionate earthquake damage exists where the building has significant damage in even a very small earthquake. This damage is an indicator of severe damage, possibly collapse, in a larger future event. Where disproportionate earthquake damage is found, the building would be subject to evaluation with reduced loads and possibly a required retrofit, again with reduced loads.

Important items to note about this section:

- This section only applies in Seismic Design Category D, E and F, so it will not have surprising effects in communities otherwise unprepared or unaware of earthquakes.
- This section only applies where the measured shaking is low—0.3 second spectral acceleration under 0.4g—less than about 40 percent of design basis loads for new buildings.
- This section applies where, even under these small loads, the damage is significant. The proposed capacity loss threshold of 10 percent might appear small, but in Seismic Design Category D, E and F, with spectral acceleration less than 0.4g, any decent building really should have zero structural damage.
- Reduced loads are allowed for any dis-proportionate earthquake damage-triggered evaluation or retrofit.

[BS] 405.2.3 Substantial structural damage to vertical elements of the lateral force-resisting system. A building that has sustained *substantial structural damage* to the vertical elements of its lateral force-resisting system shall be evaluated in accordance with Section 405.2.3.1, and either repaired in accordance with Section 405.2.3.2 or repaired and retrofitted in accordance with Section 405.2.3.3, depending on the results of the evaluation.

Exceptions:

1. Buildings assigned to Seismic Design Category A, B or C whose *substantial structural damage* was not caused by earthquake need not be evaluated or retrofitted for load combinations that include earthquake effects.
2. One- and two-family dwellings need not be evaluated or retrofitted for load combinations that include earthquake effects.

❖ This section provides requirements that apply where the damage threshold regarding the extent of the damage to the vertical elements of the lateral-force-resisting system in any story is exceeded. Substantial structural damage to the lateral system results in the evaluation of the entire building for wind and seismic loads (see Section 405.2.3.1). The emphasis is placed on vertical elements, such as walls and columns, rather than horizontal elements, because the vertical elements of the lateral-force-resisting system primarily determine the structure's response, particularly to earthquakes.

There are two exceptions that exempt certain combinations of buildings: seismic risk and damage from required seismic upgrades. Basic repair—that is, restoring the predamaged condition—is still required even for the exceptions outlined.

Exception 1 is for buildings in areas of low or moderate seismicity (Seismic Design Category A, B or C), where the damage was not caused by an earthquake and, therefore, would not be required to be evaluated or rehabilitated for load combinations that include earthquake effects. Where earthquakes are rare, it serves no significant public purpose to require seismic upgrades following damage caused by fire, collision or wind.

Exception 2 is for one- and two-family dwellings, where the public risk is especially low even though the damage may be associated with earthquake effects.

[BS] 405.2.3.1 Evaluation. The building shall be evaluated by a registered design professional, and the evaluation findings shall be submitted to the *code official*. The evaluation shall establish whether the damaged building, if repaired to its predamage state, would comply with the provisions of the *International Building Code* for load combinations that include wind or earthquake effects, except that the seismic forces shall be the reduced seismic forces.

❖ The extent of repairs is based on an evaluation prepared by a registered design professional. Generally, the code's approach is that complete structural upgrades should be relatively rare. In this section, a structural upgrade is only required when there is substantial structural damage to the lateral system and only where the evaluation shows that the predamaged building was substandard.

[BS] 405.2.3.2 Extent of repair for compliant buildings. If the evaluation establishes that the building in its predamage condition complies with the provisions of Section 405.2.3.1, then the damaged elements shall be permitted to be restored to their predamage condition.

❖ Where the evaluation establishes that the predamaged building meets the structural provisions of the code as provided for in Section 405.2.3.1, then the repairs may be limited to a restoration of the structural components based on the condition prior to the damage.

[BS] 405.2.3.3 Extent of repair for noncompliant buildings. If the evaluation does not establish that the building in its predamage condition complies with the provisions of Section 405.2.3.1, then the building shall be retrofitted to comply with the provisions of this section. The wind loads for the *repair* and *retrofit* shall be those required by the building code in effect at the time of original construction, unless the damage was caused by wind, in which case the wind loads shall be in accordance with the *International Building Code*. The seismic loads for this *retrofit* design shall be those required by the building code in effect at the time of original construction, but not less than the reduced seismic forces.

❖ If the evaluation of the building, in accordance with Section 405.2.3.1, shows that, in the hypothetically repaired condition, the building would not comply with the established requirements, then the building must be rehabilitated as described in this section. The general requirement is to comply with the IBC load combinations. These load combinations establish the required strength of structural members.

The effects of wind and seismic loads warrant special consideration. In determining the level of compliance for repairs to buildings that have sustained substantial structural damage, it is important to determine if wind forces have caused that damage. If so, it is considered prudent to require repairs to wind-damaged buildings to comply with the wind-load provisions from the current code. Seismic forces for the rehabilitation can be those required by the building code in effect at the time of the building's construction, but this may not be less than the reduced seismic force level as described in Section 405.2.3.1.

[BS] 405.2.4 Substantial structural damage to gravity load-carrying components. Gravity load-carrying components that have sustained *substantial structural damage* shall be rehabilitated to comply with the applicable provisions for dead, live and snow loads in the *International Building Code*. Undamaged gravity load-carrying components that receive dead, live or snow loads from rehabilitated components shall also be rehabilitated if required to comply with the design loads of the *rehabilitation* design.

❖ Substantial structural damage to gravity load-carrying elements, such as columns or bearing walls, must be repaired so that these members are adequate to resist the dead, live and snow loads in accordance with current code requirements. If rehabilitation is required to ensure that the gravity load-carrying element complies with current code, all portions of the gravity load path that provide support to the rehabilitated member will also need to be analyzed to resist the current dead, live and snow loads.

[BS] 405.2.4.1 Lateral force-resisting elements. Regardless of the level of damage to vertical elements of the lateral force-resisting system, if *substantial structural damage* to gravity load-carrying components was caused primarily by wind or seismic effects, then the building shall be evaluated in accordance with Section 405.2.3.1 and, if noncompliant, retrofitted in accordance with Section 405.2.3.3.

Exceptions:

1. Buildings assigned to Seismic Design Category A, B or C whose *substantial structural damage* was not caused by earthquake need not be evaluated or retrofitted for load combinations that include earthquake effects.
2. One- and two-family dwellings need not be evaluated or retrofitted for load combinations that include earthquake effects.

❖ In determining the extent of repairs to these gravity load-carrying elements that are not part of the lateral-force-resisting system, it is important to determine if wind or earthquakes have caused the structural damage. If the substantial structural damage is caused by wind or an earthquake, the lateral system must be checked even if no damage is apparent. Where this is the case, then the structure must be evaluated in accordance with Section 405.2.3.1.

There are two exceptions that acknowledge that applying this requirement in some cases is excessive and may have the effect of discouraging or delaying certain repairs by imposing the additional costs of a seismic upgrade. Exception 1 exempts one- and two-family dwellings where the risk to the public of poor earthquake performance is especially low. Exception 2 exempts buildings in areas of low or moderate seismicity where the damage was caused by something other than an earthquake. Where earthquakes are rare, it serves no significant public purpose to require seismic upgrades following damage caused by fire, collision, wind and other events. Basic repair—that is, restoring to the predamaged condition—is still required.

[BS] 405.2.5 Substantial structural damage to snow load-carrying components. Where substantial structural damage to any snow load-carrying components is caused by or related to snow load effects, any components required to carry snow loads on roof framing of similar construction shall be repaired,