

# CHALLENGES, VARIABLES AND MISINTERPRETATIONS IN

# NAVIGATING BUILDING CODES FOR STRUCTURAL REPAIRS

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Building codes extend back to the 18th century B.C. with the Babylonian Law Code known as the “Code of Hammurabi.” In the thousands of years since codes were first conceived, building codes have been envisioned, developed, and optimized. Building codes vary from jurisdiction to jurisdiction, are constantly revised, and are often supplemented by interpretations and commentary. The purpose of having building codes is to ensure minimum standards for construction of new buildings, as well as for repairs to existing buildings following property damage, including catastrophes such as fire, flood, or hurricane. Thus, building codes serve a valuable purpose but are widely regarded as open for interpretation. In this paper, we will discuss common challenges, variables, and misinterpretations when navigating building codes for essential structural repairs.

## Highlights

- Building code origins
- How codes differ amongst jurisdictions
- How the codes generally apply to structural and component repairs

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Navigating building code requirements can be challenging because they are often extensive and complex, coupled with inherent issues in interpretation and application. This difficulty increases the potential for misinterpretations or misconceptions that can lead to an inaccurate proposal for damage repairs, which compounds the estimation of repair costs. Building codes play an important role when evaluating damaged structures and can influence or mandate:

- The extent of investigations required across an existing building before repairs can be executed;
- Necessary upgrades made to damaged components during repairs;
- An increase to the scope of repair work beyond damaged areas; and,
- Changes or increases to construction time and costs.

Building code repair requirements vary between local jurisdictions and, in some regions, within a jurisdiction. Codes also depend on local hazards (e.g., flooding potential) or the extent and type of damage a building has sustained.

Moreover, there are often multiple parties with varying interests involved in the resolution process. As such, misconceptions about the building code requirements can lead to unnecessary contention or litigation. This article offers a brief history of the model codes, a discussion of the adoption process for building codes, and an insight into model code requirements for structural repair to aid in reducing code misinterpretations.

# Varying Adoptions of Building Codes

Before 1994, there were three major organizations producing model building codes in the United States, including:

- Building Officials and Code Administrators International, Inc. (BOCA)
- International Conference of Building Officials (ICBO)
- Southern Building Code Congress International, Inc. (SBCCI)

In 1994, these three separate organizations were brought together with the establishment of the International Code Council (ICC). Per their website<sup>1</sup>, the goal of the ICC was to develop a single set of national model construction codes. There are currently 16 model codes issued by the ICC, including the International Building Code (IBC) and the International Existing Building Code (IEBC), which are the model codes that are the primary focus of this article. Notably, the 2018 IBC and IEBC are the most recent editions of these model codes, with new editions published in three-year intervals. New editions of the IBC and IEBC are anticipated in 2021.

## Enforcement by Jurisdiction

Before a jurisdiction enforces model codes, they must first be adopted by the local authority (e.g. state, county, city). While jurisdictions widely adopt the ICC codes throughout the U.S., the specific edition frequently differs. Consequently, building code requirements vary widely between jurisdictions and, as such, a review of local code adoptions and amendments are necessary when researching building codes for a particular property or project.



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## Structural Repairs: What you Need to Know

Structural engineers or experts completing forensic investigations are commonly asked to determine if structural upgrades are required to facilitate repairs to a damaged building. The IEBC defines *Repairs* to a building. In many jurisdictions, the local authority has adopted an edition of the IEBC. This code outlines the requirements for work completed on existing structures, including repairs.

While upgrades are generally necessary within the majority of the above classifications, this isn't always true for repairs. Excerpts from other work classifications (e.g. alterations) can be misinterpreted as requiring upgrades for structural repair work.

It is critical to understand the classification of the proposed work when referencing the IEBC, as the requirements vary. Such classifications defined within the IEBC include:

- *Repairs*
- *Additions*
- *Alterations (levels 1 - 3)*
- *Change in occupancy*

<sup>1</sup> <https://www.iccsafe.org/about/who-we-are/>

## Repair: Requirements and Exceptions

The definition of *Repairs* typically applies to work limited to rectifying damaged structures (e.g. storm forces, vehicle impacts, excessive gravity loading). For this paper, we will be focusing on repairs rather than additions, alterations, and changes in occupancy, which are less often the focus of a forensic engineering investigation. The 2015 IEBC, which at the time of this paper is widely adopted by jurisdictions across the United States<sup>2</sup> defines *Repair* as follows:

“The reconstruction or renewal of any part of an existing building for the purpose of its maintenance or to correct damage.”<sup>3</sup>

Chapter 6 of the IEBC outlines the requirements for repairs that include the following general provision surrounding conformance, “The work shall not make the building less conforming than it was before the repair was undertaken.”

The above doesn’t necessitate upgrades to buildings, components and systems during repairs to satisfy the requirements of the current building code. Rather, the excerpt mandates that repairs cannot make the building less compliant with currently adopted codes for new construction. This excerpt indicates that, unless noted otherwise within the IEBC, removing and replacing damaged components with like materials is generally acceptable.

This notion is further supported by the following excerpt from *Building Elements and Materials* within the *Repair* classification:

- **Existing building 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 render the building or structure unsafe or dangerous as defined in Chapter 2.
- **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 no dangerous or unsafe condition, as defined in Chapter 2, is created. Hazardous materials, such as asbestos and lead-based paint, shall not be used where the code for new construction would not permit their use in buildings of similar occupancy, purpose and location.



### IEBC Requirements for Repair

The above indicates that, in general, it is not necessary to upgrade existing undamaged materials as they are typically permitted to remain within a building during, or following, the repair process. Moreover, damaged components and systems can generally be replaced with similar items, indicating that upgrading would not typically be required.

2 Insurance Institute for Business & Home Safety, Building Codes by State, URL: <https://ibhs.org/public-policy/building-codes-by-state/#top>

3 International Code Council, 2015 International Existing Building Code, Fifth Printing: November 2015. URL: <https://codes.iccsafe.org/content/IEBC2015/chapter-2-definitions>

## Exceptions

Beyond the presence of dangerous or unsafe conditions, before the building sustained damages, there are additional exceptions, including:

- Structures that have sustained *substantial structural damage*
- Structures located in flood hazard areas that have sustained *Substantial Damage*

### *Substantial Structural Damage*

It is important to note that *substantial structural damage* and *substantial damage* have different and specific definitions within the IEBC. Nevertheless, where the criteria for either has been satisfied, substantial upgrades to the building's structural components or systems may be required.

Per the 2015 IEBC, "For damage less than *substantial structural damage*, the damaged elements shall be permitted to be restored to their pre-damage condition." However, when *substantial structural damage* occurs, the IEBC requires registered design professionals to evaluate the existing structure, including undamaged elements. Dependent upon the findings of this evaluation, relatively extensive remediation may be mandated to comply with the current local building code. Such assessments and mandates, frequently requiring destructive investigation and material testing, can make repairing structures with *substantial structural damage* costly compared to demolition or reconstruction. This is particularly true for structures constructed before the adoption of more current ICC building codes.

“...in many instances, significant upgrading, altering, and retrofitting of existing buildings to comply with current building codes is not required during repair of structural damage...”

The 2018 IEBC defines *substantial structural damage* as a condition where one or both of the following apply:

1. In any story, the vertical elements of the lateral force-resisting system have suffered damage such that the lateral load-carrying capacity in any horizontal direction has been reduced by more than 33 percent from its pre-damage condition.
2. The capacity of any vertical gravity load carrying component, or any group of such components, that supports more than 30 percent of the total area of the structure's floor(s) and roof(s) has been reduced more than 20 percent from its pre-damage condition. The remaining capacity of such affected elements, for all dead and live loads, is less than 75 percent of that required by this code for new buildings of similar structure, purpose and location.



While the above criteria often requires a structural engineer to evaluate the building, the use of the word vertical can greatly simplify the assessment. Vertical refers to the orientation of the components. For example, damage to walls, columns, and frames may result in *substantial structural damage*. However, damage limited to horizontal components (e.g. beams, joists, sheathing, decking) would not constitute *substantial structural damage*, regardless of the extent of the area(s) or quantity of components.

## Substantial Damage

Concerning *substantial damage*, the 2015 IEBC structural repair requirements include the following statement, “In flood hazard areas, buildings that have sustained *substantial damage* shall be brought into compliance with Section 1612 [titled “Flood Loads”] of the International Building Code.”

The IEBC defines *substantial damage* as follows: “For the purpose of determining compliance with the flood provisions of this code, damage of any origin sustained by a structure whereby the cost of restoring the structure to its before-damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred.”

Similar to *substantial structural damage*, remediating existing damaged structures to comply with current flood load requirements can be costly and, in some instances, exceed the cost for demolition and reconstruction. Nevertheless, it is important to note that repair requirements triggered by *substantial damage* only apply to damaged buildings in flood hazard areas.

The 2015 IEBC defines a *Flood Hazard Area* as follows:

1. The area within a flood plain subject to a one percent or greater chance of flooding in any year.
2. The area designated as a flood hazard area on a community’s flood hazard map or otherwise legally designated.

The boundaries for flood hazard areas can typically be identified through the review of local ordinances and the Federal Emergency Management Agency’s (FEMA’s) Flood Insurance Rate Maps (FIRMs).

## Takeaways

The language contained within building codes are technically focused and often interpreted differently, leading to misinterpretation and confusion. This is compounded with building code repair requirements varying significantly between local jurisdictions, or regions within a jurisdiction, due to differing local hazards, adoptions, and amendments. As such, a review of local code adoptions and amendments are necessary when investigating requirements for any particular structure to ensure the appropriate requirements are reviewed and referenced.

Nonetheless, in many instances, significant upgrading, altering, and retrofitting of existing buildings to comply with current building codes is not required during repair of structural damage, which is often alleged by parties that misinterpret or misunderstand the building codes. In compliance with the IEBC, unless a structure is dangerous or unsafe, the building has sustained substantial structural damage, or is substantially damaged and in a flood hazard area, restoring damaged elements to their pre-damage condition is generally permitted. Sound forensic evaluations, coupled with a proper interpretation of building codes, will create less confusion and more understanding with industry professionals completing damage and restoration assignments.