

Exam 3: Cat Risk Management Insurance Fundamentals

Part C – Module Title: Year Built (Building Codes)

Study Note

Learning Objectives:

- Describe the use of the year built to indicate the age of the building, and what code(s) may have been in place at the time of construction
- Identify key hurricane and earthquake events that influenced changes in building codes.

This document contains original content.

Year built is one of the primary risk characteristics that model vendors use to differentiate hurricane vulnerability. It is used to infer what codes may have been in place at the time of construction. Key catastrophic events resulted in lessons learned that have influenced changes in building codes over time. These building code changes are generally improvements and therefore a newer year built typically results in less damage than an older year built when exposed to the same hazard. Below is a summary of the key building code changes over time and the catastrophic events that influenced the building code change.

Hurricane

Pre-1995

Prior to 1995, three separate building code organizations existed for building code adoption and enforcement:

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

The three organizations maintained separate building codes with a regional focus – BOCA along the East Coast and Midwest, ICBO in the Western States and SBCCI in the Southeast. Standards were not always consistent between the three organizations and code adoption and enforcement did not always occur at the state level.

Hurricane Andrew made landfall just south of Miami as a Category 5 hurricane in 1992. It became the costliest event at the time, surpassing the records left behind from Hurricane Hugo's Category 4 landfall in South Carolina in 1989.

Hurricane Andrew, along with the recent memory of Hurricane Hugo, drew attention to the lack of consistent building code and adoption and enforcement at the state level. It also highlighted the need for additional emphasis on better protection of the building envelope components (roof covering, windows, doors, etc.). Existing building codes in place at the time primarily focused on the design of the Main Wind-Force Resisting System (the beams, walls and columns that support the structure). The devastation from these events showed that failure of the building envelope while the Main Wind-Force Resisting System remains intact can still result in significant damage.

In 1994, the three regional building code organizations combined into a single building code organization known as the International Code Council (ICC), with the goal of creating a single building code standard, updated every three years, and enforced at the state-level.

1995 to 2001

As the ICC worked towards their goals, more immediate efforts to improve building codes were taking place:

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- The American Society of Civil Engineers is the organization that maintains the design wind speed maps in the building codes. Design wind speed maps were updated from sustained wind speeds to peak gust wind speeds. This elevated the design wind speed requirements, particularly along the coast.
- The SBCCI created a prescriptive design standard for residential structures. Prescriptive design standards inform a contractor of how many nails to install in the roof decking or what type of connections to attach the roof to the wall. This is much more straight-forward than specifying design loads. The prescriptive standards provided better clarity around building code requirements and resulted in better enforcement of the codes.

Post-2001

Florida was the first state to adopt the codes from the ICC in 2002. These codes introduced the Wind-Borne Debris Region (WBDR), which was designated by areas of high design wind speeds. In the WBDR, additional criteria were in place to protect the building envelope of a structure. The Florida ICC also declared Miami-Dade, Broward and Palm Beach Counties in the High Velocity Hurricane Zone (HVHZ) where design standards in this region were further elevated.

The 2004 landfalls of Hurricanes Charley, Frances, Ivan and Jeanne tested the new statewide building codes in Florida. Despite the significant loss these events caused to the industry, homes built to the new codes fared much better than those that were not.

Other states followed suit in adoption of the ICC. Some states adopted the code as is, while other states adopted with local amendments; some of which weaken the effectiveness of the code.

The implementation of year built as a primary risk characteristic to differentiate risk will vary from model vendor to model vendor, but all model vendors have implemented some means of acknowledging these key moments in history where significant changes were made to the codes.

Earthquake

Differentiation of vulnerability based on year built for earthquake varies more across the model vendors, as less earthquakes have occurred to influence changes in building codes. There are four key California events that have helped drive advancement in earthquake design requirements.

1993 Long Beach

The 1933 Long Beach Earthquake was an M6.4 event that occurred in Southern California. While this might only be a moderate event today, in 1933 this event caused significant damage due to the poor construction quality of the structures in this area, including severe damage to school buildings.

The Field Act was introduced in 1933 following the event in Long Beach. The Field Act sets minimum seismic safety requirements and requires local governments to have building departments that issue permits for new construction and alteration of existing buildings.

1971 San Fernando

The 1971 San Fernando earthquake was a M6.5 event that occurred in Southern California. The event caused significant damage to multiple healthcare facilities in the area and highlighted the importance more stringent design requirements for critical care facilities.

The Uniform Building Code (UBC) was introduced in 1973 by the ICBO following the 1971 San Fernando Earthquake. It was the first building code which increased uniformity across local jurisdictions. It also introduced special consideration for ductility and lateral loads.

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1989 Loma Prieta

The 1989 Loma Prieta Earthquake was a M6.9 earthquake that ruptured along a section of the San Andreas Fault in Northern California. The earthquake caused significant damage to infrastructure throughout the Bay Area and was infamously known for occurring during a live broadcast of the 1989 World Series.

Two years later, in 1991, the National Earthquake Hazard Reduction Program (NEHRP) released new design standards that became the basis of earthquake code language across the three regional code organizations.

1994 Northridge

The 1994 Northridge Earthquake was a M6.7 event in Southern California that occurred very close to where the 1971 San Fernando Earthquake occurred 20+ years before.

The Northridge Earthquake identified several additional areas for improvements to building codes, particularly related to structural detailing and design. Several multi-family structures failed due to their soft story design. This type of design is no longer permitted in California unless the details are carefully designed by a structural engineer. Several failures also occurred to flawed weld connections on commercial steel moment resisting frame structures. This led to a redesign of the connections for this construction class.

Lastly, just like Hurricane Andrew provided motivation for a single national building code in hurricane-prone states, the 1994 Northridge earthquake was a motivator for a single national building code in seismically active states. This event also helped pave the way for the International Building Code (IBC), which combined seismic provisions from the Uniform, Standard and Southern building codes into a single code adopted at the state level.