



UP TO 90% OR MORE OF BUILDINGS IN MANY MAJOR CITIES WERE NOT BUILT TO MODERN BUILDING CODE STANDARDS

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Ten Misconceptions About Buildings and Earthquakes

1 Cities would not allow unsafe buildings to be occupied or sold. **UNTRUE!**

Building codes evolve dramatically over time, as technologies improve and engineers learn from each new disaster. This knowledge reveals previously hidden hazards in existing buildings. Most communities do not require these dangerous buildings be demolished or even retrofitted.



2 Newer buildings are essentially earthquake proof. **UNTRUE!**

Building codes are minimum standards set to prevent deadly collapse, not to eliminate damage or make sure buildings stay usable. When two major earthquakes hit Christchurch, New Zealand in 2011, most modern structures performed as expected to the code—only two buildings collapsed. However, 70% of the buildings in the downtown area were eventually demolished due to extensive damage.

3 The most dangerous buildings rent for less or are located only in poorer neighborhoods. **UNTRUE!**

In many US cities, the most desirable areas were built decades ago. Older structures there can command premium rents owing to location and historic charm. As long as these older buildings in prime locations remain desirable, owners have little incentive to investigate their risk or invest in voluntary seismic improvements.

4 Damage to the building's structure is the most costly type of damage in earthquakes. **UNTRUE!**



Dramatic structural failures gets press coverage but past earthquakes show that the most expensive repair costs are typically non-structural elements like partitions, ceilings, fire sprinkler systems, mechanical and electrical components, and replacement of high-value contents. Lost revenue and other business interruption costs can even exceed the value of the building itself.

5 A typical retrofit brings an existing building up to current code. **UNTRUE!**

In a voluntary or mandated retrofit, most cities do not require an existing building be brought into full compliance with the current building code. For retrofits, the performance goals of various owners vary widely and remain essentially hidden, leading to uncertainties about the actual value of mitigation efforts.

6 "Value Engineering" does not diminish a building's level of seismic performance. **UNTRUE!**

With the aid of computer modeling, value engineering can optimize building design by removing redundancies from the structural system and thereby reducing costs, usually with the goal of meeting the minimum standards of the building code. Developers are often unaware of the tradeoff—value engineering reduces upfront costs while ensuring safety, but it can also result in a building that will need to be demolished and replaced following a major earthquake.

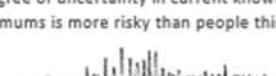
7 Designing for better seismic performance will significantly increase construction costs. **UNTRUE!**

For a new building, a seismic design that results in a four or five star USRC rating may add 1% to 10% to total up front construction costs, or about as much as a typical contingency budget. FEMA P58 and other computerized seismic models are now available to test design solutions in the early stages of a building's creation when it is cost effective to explore various approaches to earthquake resilience. Once a structure is built, retrofitting to a higher level of seismic performance can become far more expensive.



8 Seismic structural engineering is a precise science. **UNTRUE!**

Seismic engineering relies on equations that can be calculated to the nth decimal place. But those equations are based upon current best estimates for an imprecise phenomenon - earthquakes. The Great East Japan-Tohoku Earthquake was ten times stronger than scientists predicted, meaning buildings were designed using the wrong inputs to these equations. Many faults are still undiscovered. Further, our ability to predict building response to earthquakes is imprecise but improving. Given the degree of uncertainty in current knowledge, relying on code minimums is more risky than people think.



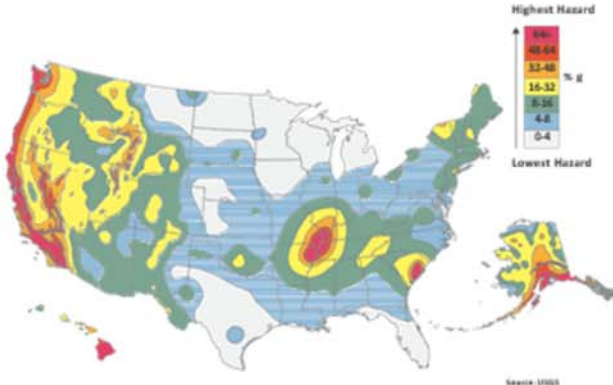
9 Distance from the epicenter is the most important factor in how much a building will be damaged. **UNTRUE!**

Although distance from the epicenter is important, soil and rock types at a specific location affect the degree of hazard. For example during the 1989 Loma Prieta earthquake the muddy ground in San Francisco's Fisherman's Wharf area shook like Jell-O while half a mile away the bedrock in Chinatown experienced ground shaking one fifth as strong.

10 Earthquakes are only a West Coast problem. **UNTRUE!**

Over 50% of the US population lives in an area where earthquakes are a threat. It's true that earthquakes are more frequent on the West Coast, Alaska and Hawaii, but in our nation's history, significantly damaging quakes occurred in Massachusetts, Missouri, Kansas, South Carolina, Indiana, Texas, New Hampshire, Montana, Illinois, Idaho, Pennsylvania, Florida, Illinois, Virginia, and Oklahoma.

The Midwest and East Coast do not have California's level of codes and standards so the damage from a 6.0 quake can be more severe. For instance, the 2011 5.8 Magnitude event in Virginia caused roughly \$300 million in damage. Repairing the Washington Monument cost \$15 million alone.



About the USRC

The US Resiliency Council is a 501(c)3 non-profit organization that helps communities understand the vulnerability of our built environment. It does this through education, certification of engineers, and evaluation of building performance in disasters.

The USRC's initial focus is on increasing seismic awareness on the West Coast but the rating system can be adopted anywhere. The USRC hopes to eventually develop similar rating systems for severe storm events such as hurricane, tornado, and flood.

SAFETY	★ ★ ★ ★
DAMAGE	★ ★ ★ ★
RECOVERY	★ ★ ★ ★

Through its building rating system for earthquakes, the USRC aims to raise public consciousness and demand for disaster resilience. USRC ratings deliver consistent, credible information on expected safety, damage, and recovery for the buildings we use and occupy every day. We also work with public and private sector partners to support broader resilience efforts. For more information, please visit:

www.usrc.org

The U.S. Resiliency Council® (USRC) was formed as a 501(c)3 nonprofit organization and launched in November 2015 to establish and implement a rating system for the performance of buildings in earthquakes and other natural hazards. The system is currently applicable to earthquake performance but the vision is for it address other hazards including wind, flood and blast. The USRC issues ratings, certifies practitioners and best practices, and technically reviews ratings shared with the public so its ratings are both credible and consistent.

Improving local community and regional resilience in natural and manmade disasters is a national imperative. Key to the success of this challenge is the need to understand the performance of the nation's building stock in terms of safety, repair cost and recovery. The vision of the USRC is to make the public more aware of their potential risks in natural disasters, and provide them with information to make better-informed decisions on owning, renting, leasing and insuring properties, so that market forces will drive the building design, and procurement process toward more resilient building design.

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